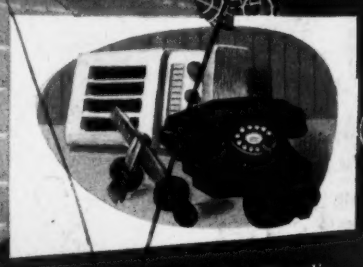
Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS

JUN 22 1953
DETROIT

HERE'S A MAN OF MANY PARTS



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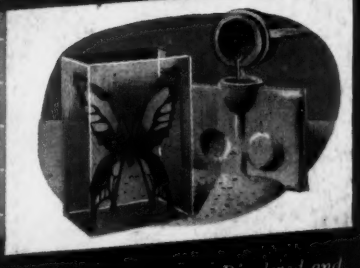

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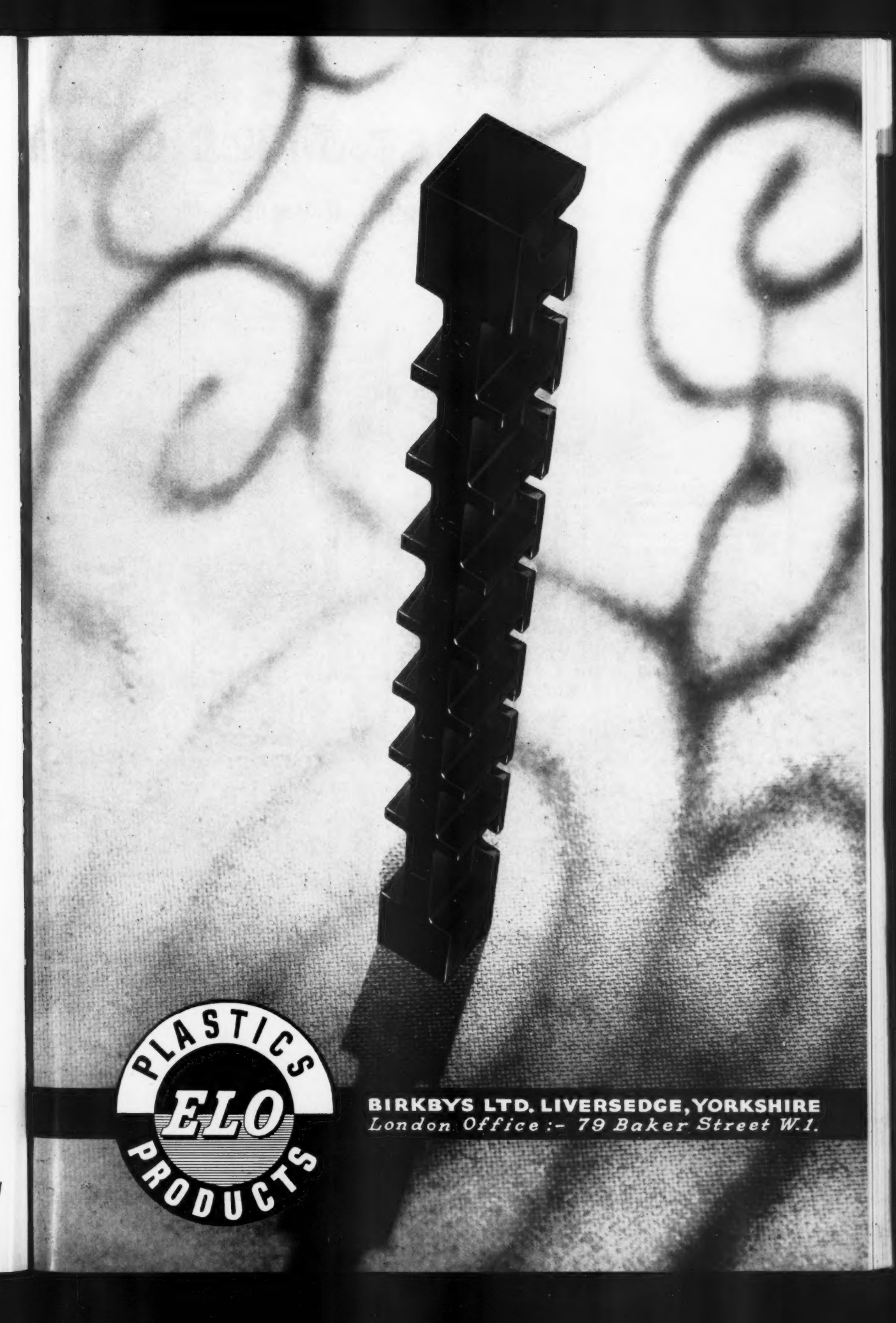
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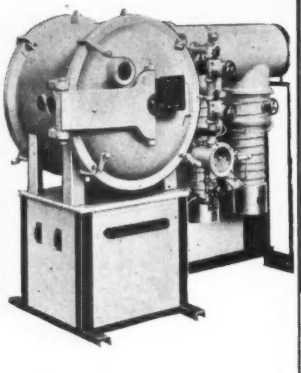
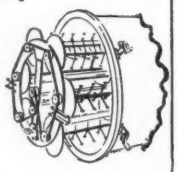
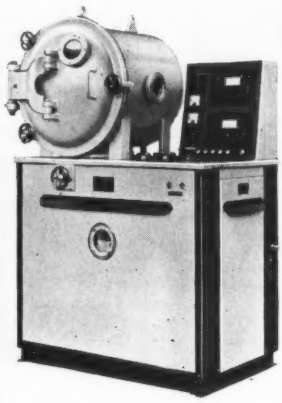
MODEL 36E EVAPORATING PLANT. A large standard coating unit for quantity coating. Where there are big batches, or the surfaces to be covered are large, the Model 36E with its range of work holders will deal with all normal production requirements.



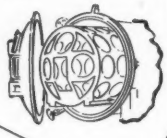
A motor-driven rotating work holder for coating intricate areas.



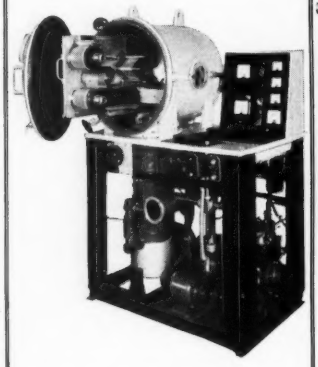
MODEL 24E EVAPORATION PLANT. Specially designed in conjunction with rotary or static work holders for quantity production.



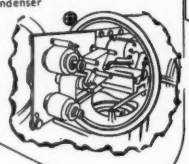
A static work holder for aluminizing head lamp reflectors



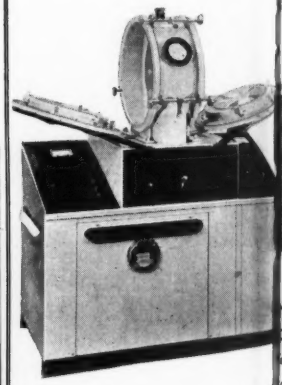
MODEL 24CE An example of a moderate size roll coating unit particularly valuable for narrow material.



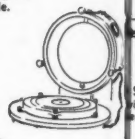
View of work chamber designed for condenser tissue metallizing.



MODEL S6 SPUTTERING PLANT. A specialized plant for metallizing gramophone record masters, two being metallized at the same time.



One of the pair of work support doors showing the large diameter cathode.



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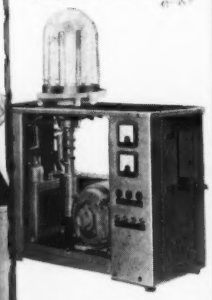
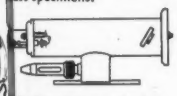


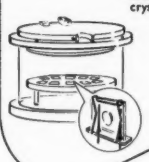
MODEL 6E S SHADOW-CASTING PLANT is the perfect laboratory companion to the electron microscope for the preparation of shadow cast specimens.



Section of vacuum chamber ing filament and specimen er.

MODEL SSA SPUTTERING PLANT. A general purpose laboratory or production unit with an 8¾ in. diameter cathode.

Chamber arrangement for quartz crystal sputtering.



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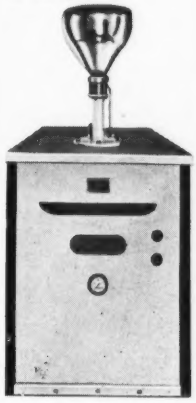
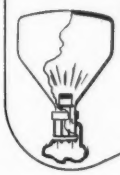
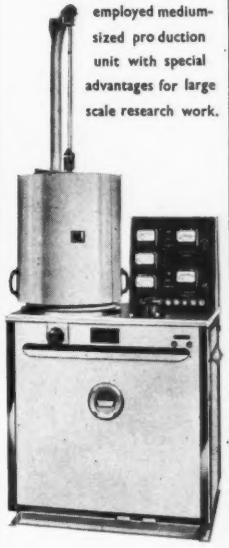


Automatic vacuum-sealed work holder and evaporating arrangement.

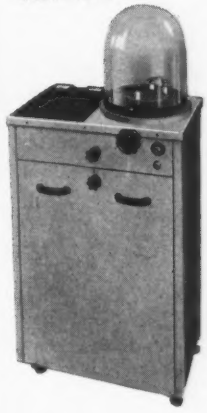


MODEL 18SE4 EVAPORATION AND SPUTTERING PLANT. The most generally employed medium-sized production unit with special advantages for large scale research work.

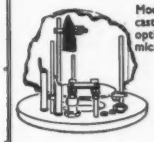


Optical work holder for anti-reflection films or 'blooming'

MODEL 12E EVAPORATION AND SPUTTERING PLANT For laboratory research and small scale production work.



Model 12E shadow casting auxiliary for optical and electron microscopy work.



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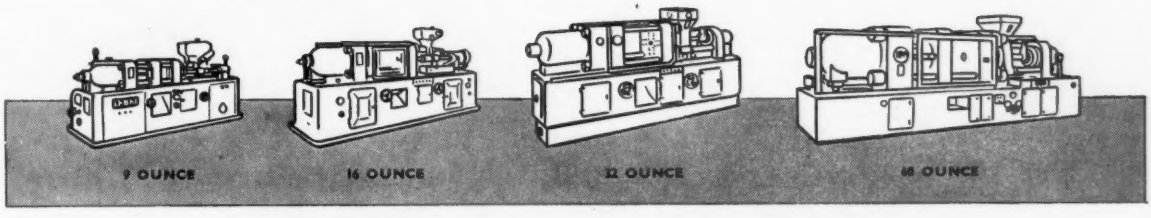

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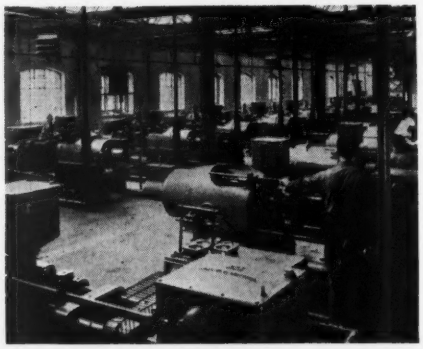

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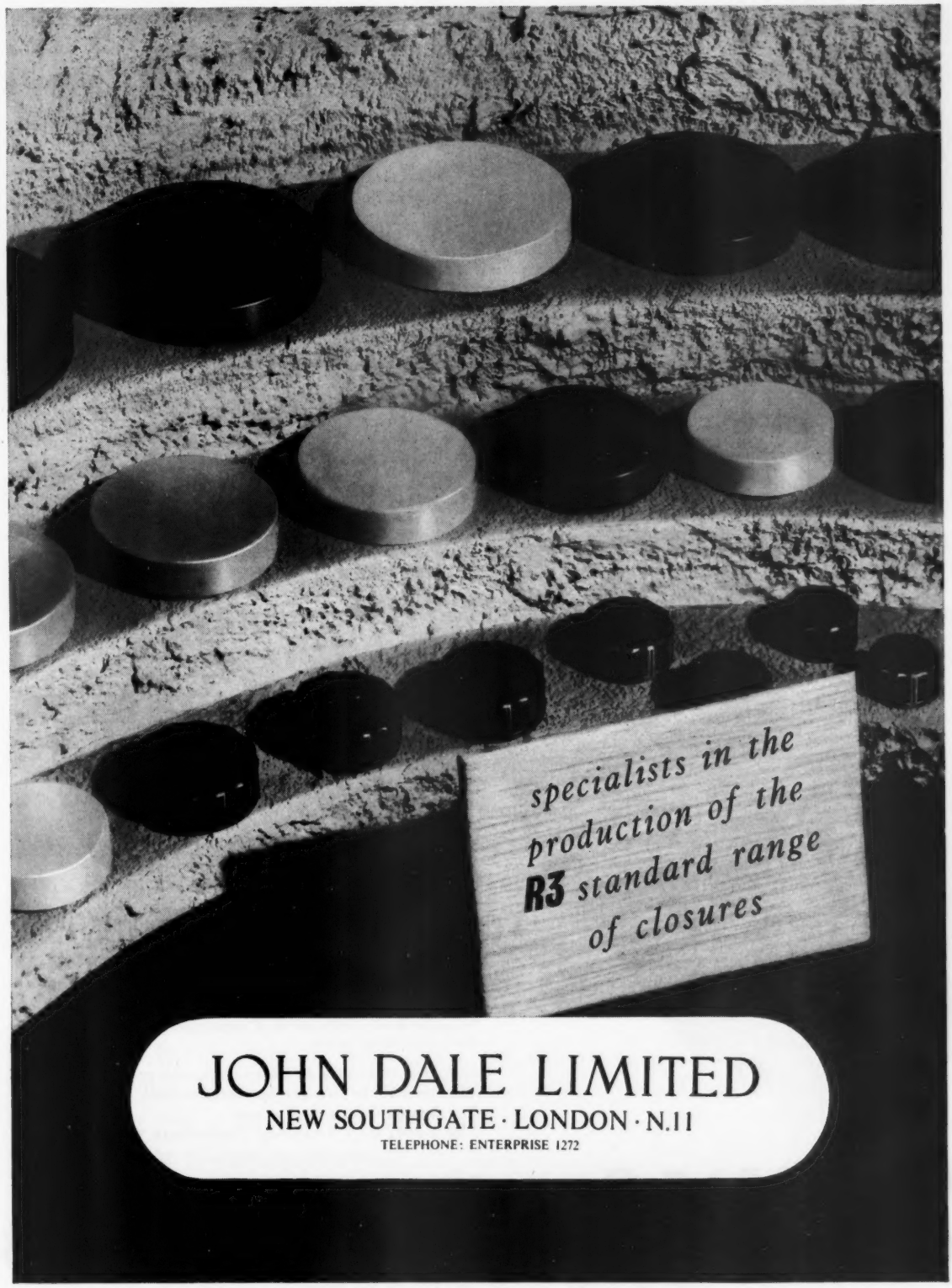
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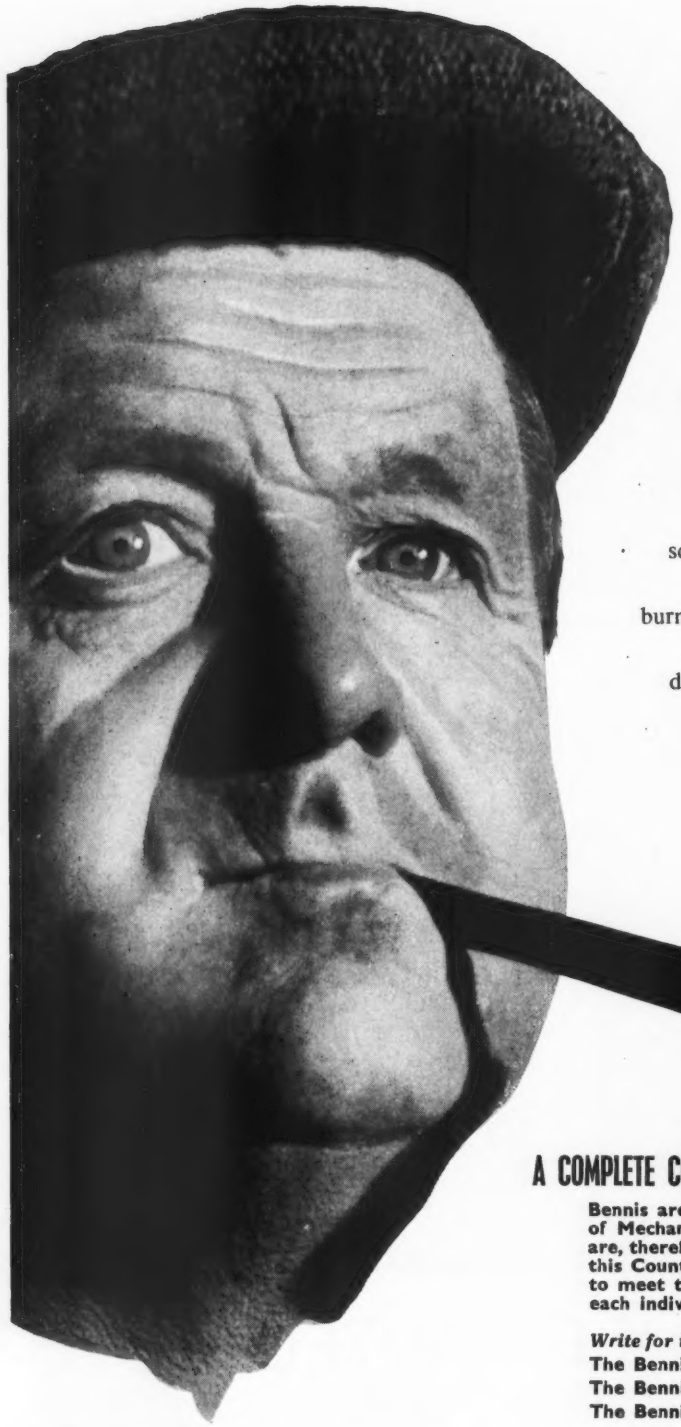

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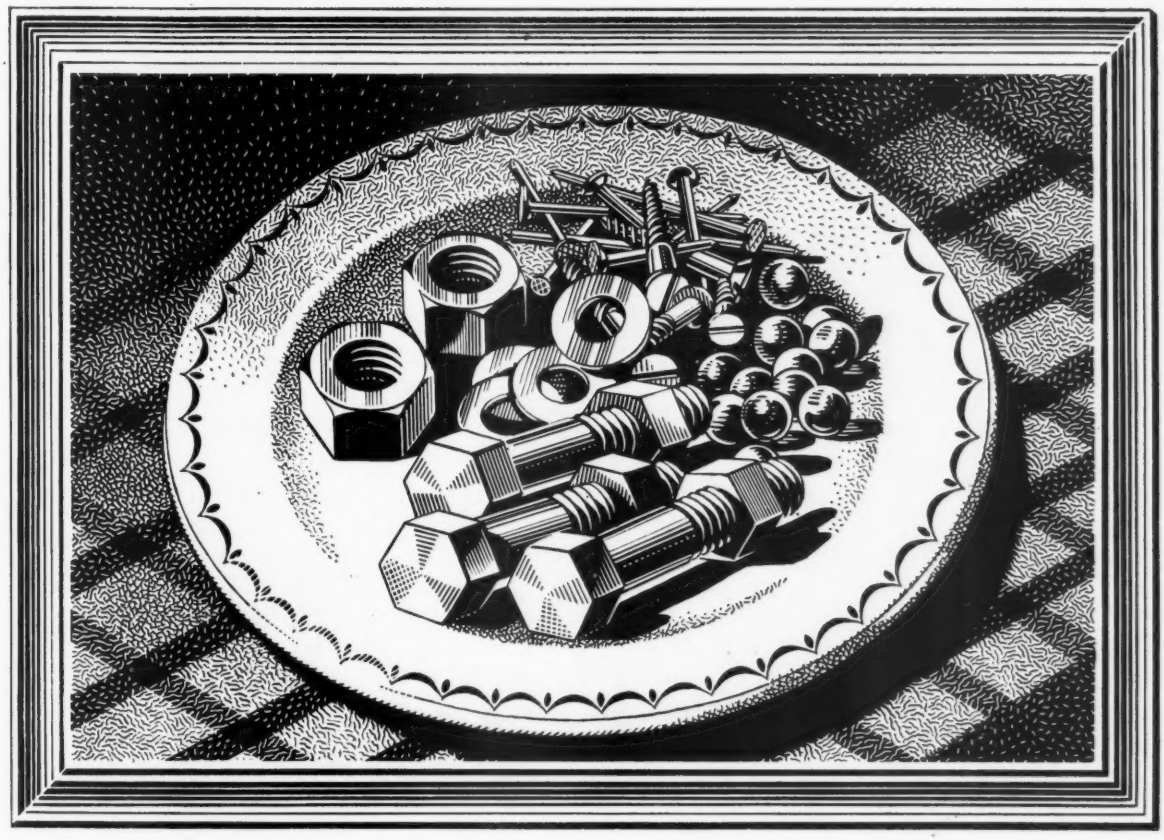

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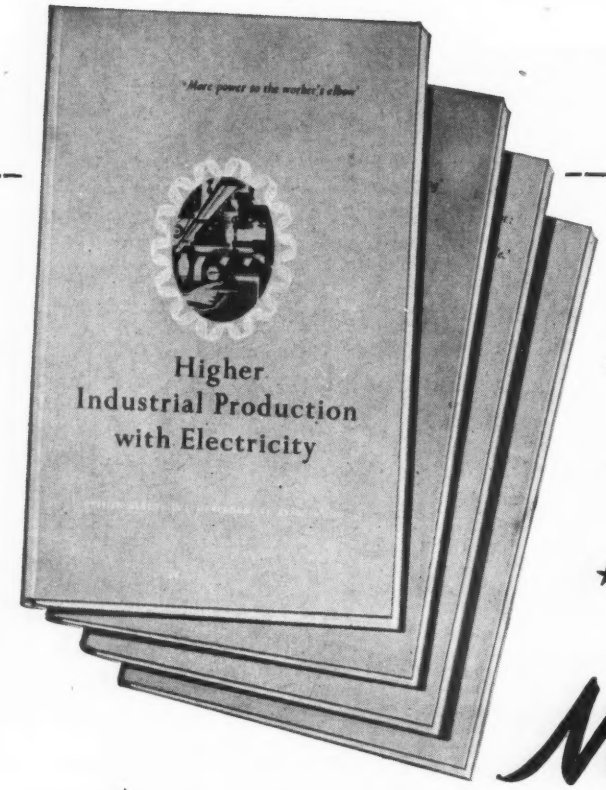

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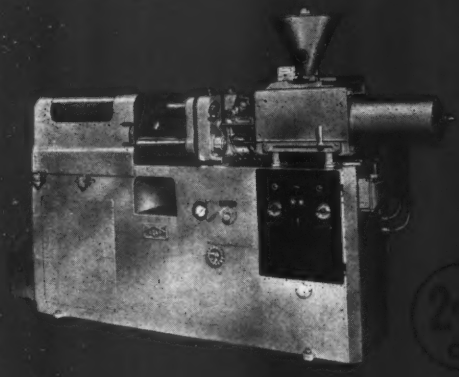

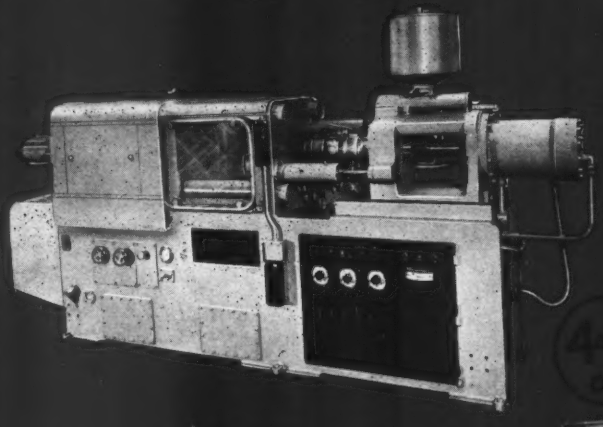

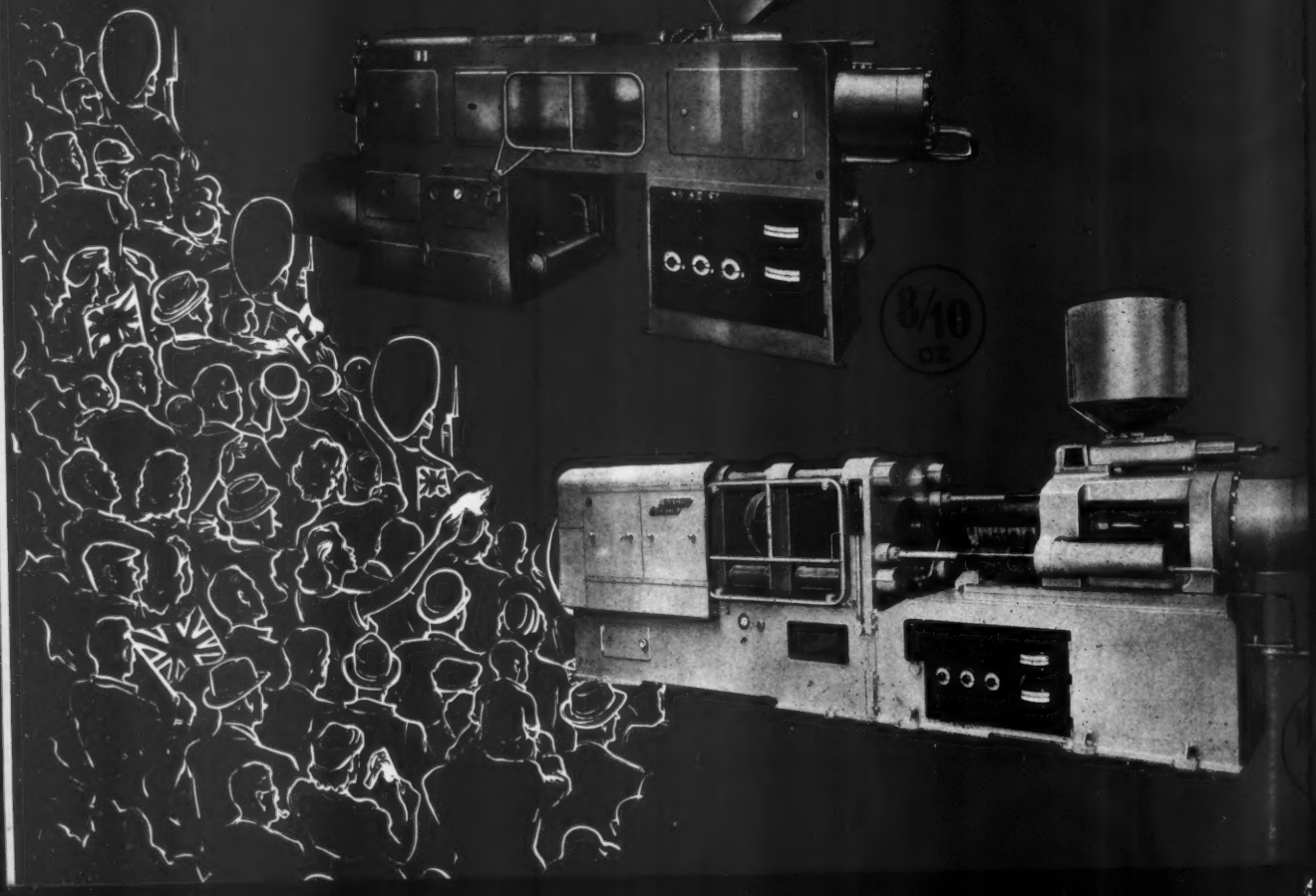

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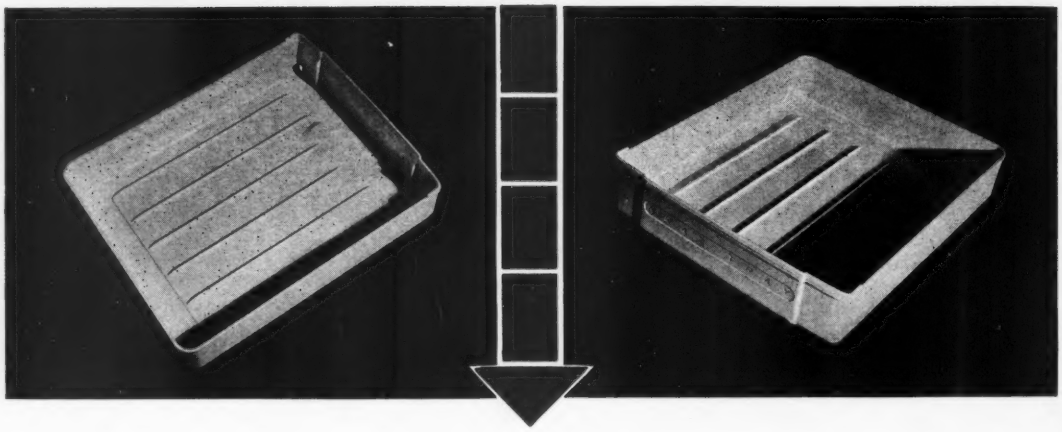

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The photographs show a refrigerator tray moulding in H.I. grade polystyrene (white, 3H066) for Nash-Kelvinator Ltd. by British Moulded Plastics Ltd. Dimensions are 11¾" x 14" x 2½".

★

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OLYMPIA · LONDON · 8-18 JUNE · 1953

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Above, Geon PVC compound granules in preheating tray. Left, the heated granules spread ready for pressing. Below, trimming flash from the prepared record.

GEON PVC MAKES HISTORY!

BBC RECORDINGS IN GEON PVC CARRY THE CORONATION STORY TO THE WORLD

The Coronation ceremony and commentaries, recorded by the B.B.C. Transcription Service and transferred to 16″ records made with Geon PVC, were flown to all parts of the world within a few hours of the ceremony.

Photographs by courtesy of the Transcription Manufacturing and Recording Company Limited, in whose works they were taken, showing Coronation records being made.

Geon PVC is used — both for transcription services and long-playing records — because *only* this plastics raw material provides the phenomenal moulding accuracy required combined with dimensional stability, low background noise, accurate reproduction and tone qualities. Please write for Geon Technical Bulletin No. G.14/51 which describes the properties and processing of Geon gramophone record moulding materials.

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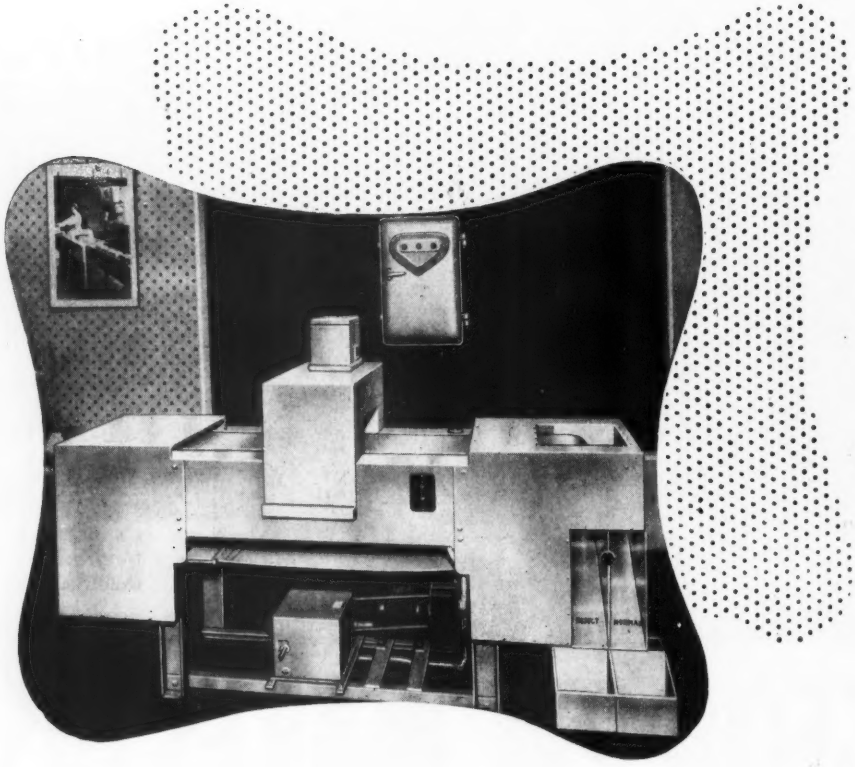

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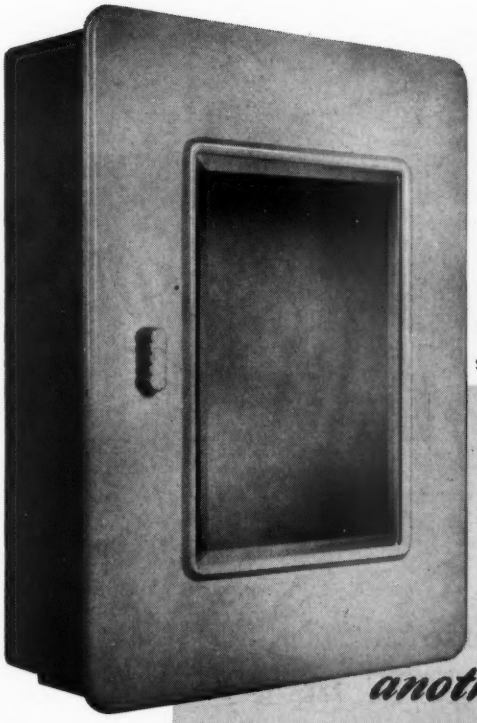

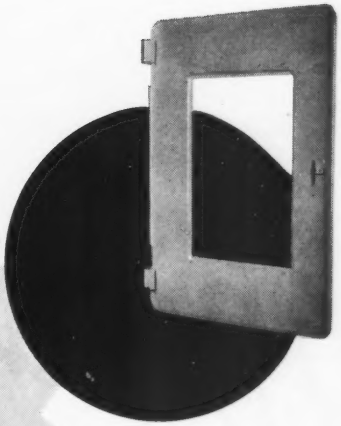

BATHROOM CABINET
By courtesy of Messrs. HOLT SIRON & CO LTD

another example of

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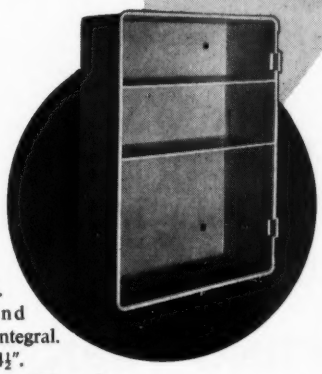
From **12** ounces-
to
60 ounces



Moulded throughout. Shelves and hinge lugs integral. 16″×12″×4½″. Cubic volume 780 cu. ins.

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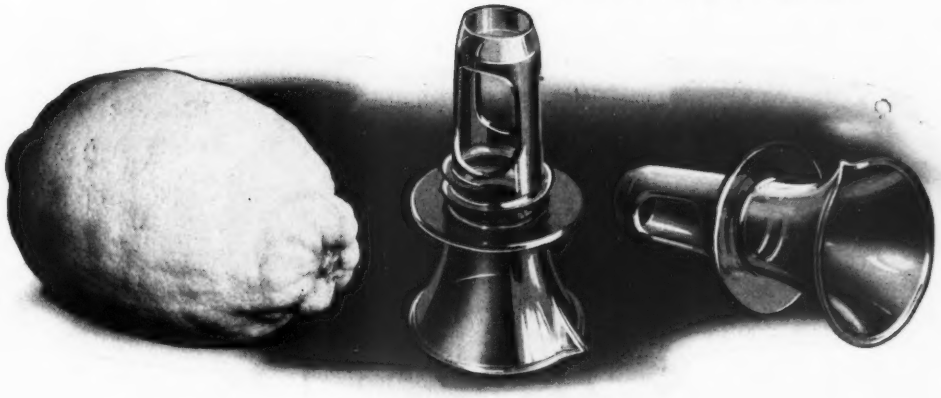
By courtesy of Messrs. Elco Plastics Ltd. of High Wycombe who produce 320 of these "Juice Rite" extractors per hour on an E.M.B. No. 9 Injection Moulder.



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Manual control by single handle or fully automatic to special order.
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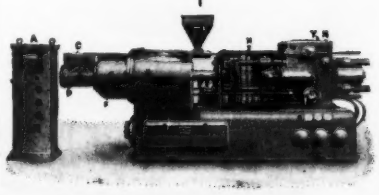

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June 8th to 18th

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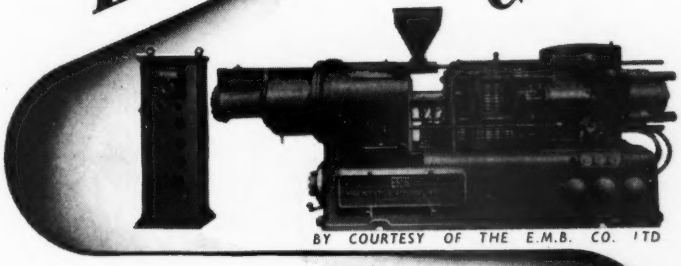
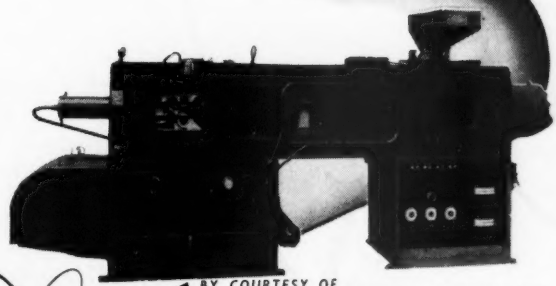
ETHER-WHEELCO ELECTRONIC CONTROLS



BY COURTESY OF THE E.M.B. CO. LTD



BY COURTESY OF THE PROJECTILE & ENGINEERING CO. LTD.

Managing Director: Good morning Mr. Brown. I understand that you are going to the Plastics Exhibition.

Mr. Brown: Yes Sir ! If there are any new machines or materials on show that will help our production in any way I want to know all about them.

M.D.: Right ! but remember to pay particular attention to Ether-Wheelco Electronic Controls.

B.: I certainly shall. I wouldn't even consider a machine without them. Good moulding depends on accurate nozzle temperature control and our experience has proved that they give the best result.

M.D.: There is no doubt about it—Ether-Wheelco Electronic Controls are the best in every respect. They cost no more than the older type, upkeep is negligible and since we have installed them, our production figures have increased by leaps and bounds.

B.: That's true . . . and in my opinion Ether-Wheelco Electronic controls are largely responsible for the great improvement in present day Plastic moulding Technique.

I noticed at the last Exhibition that they were fitted as standard equipment to 90% of the Injection Moulding Machines on view.

Technical List No. 250 describes fully Ether-Wheelco Electronic Controls, and their applications to the Plastic Industry.

May we send you a copy?

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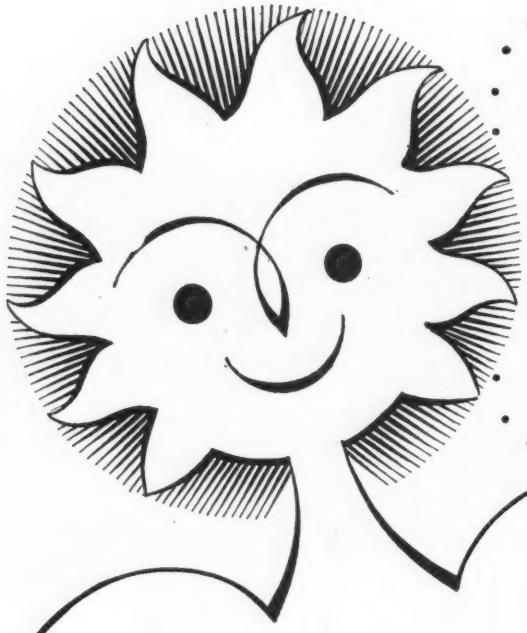

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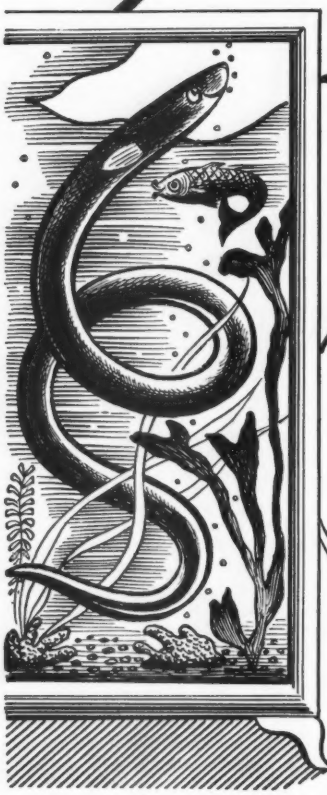

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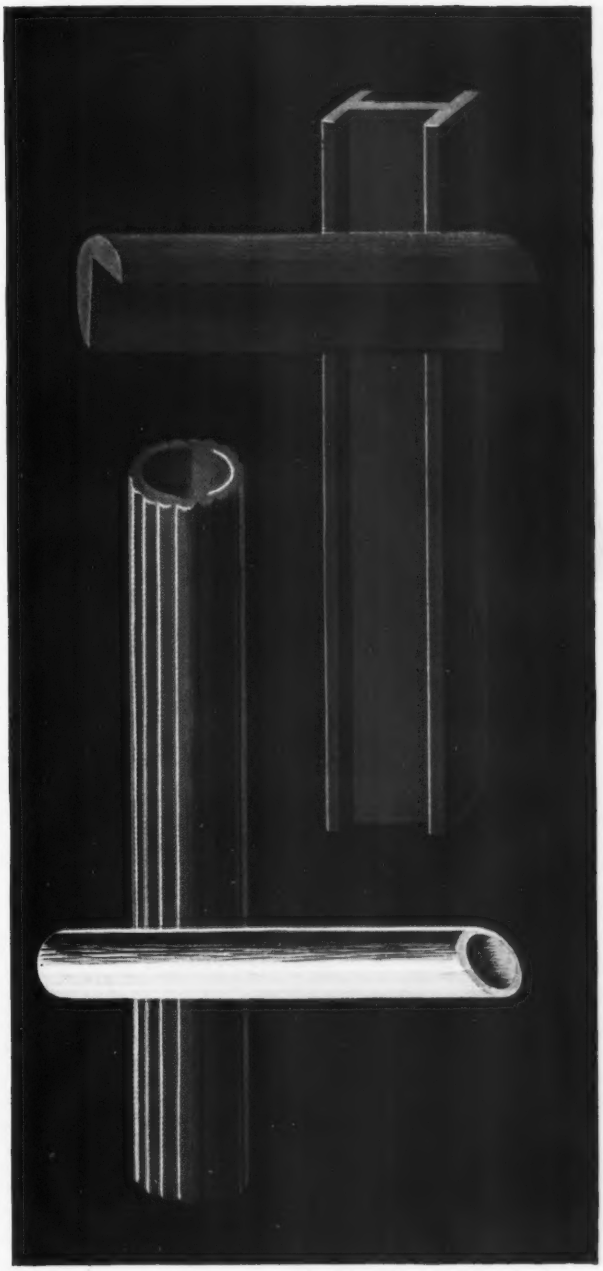
Mr. Therm burns to serve you · THE GAS COUNCIL · 1 GROSVENOR PLACE · LONDON · SW1



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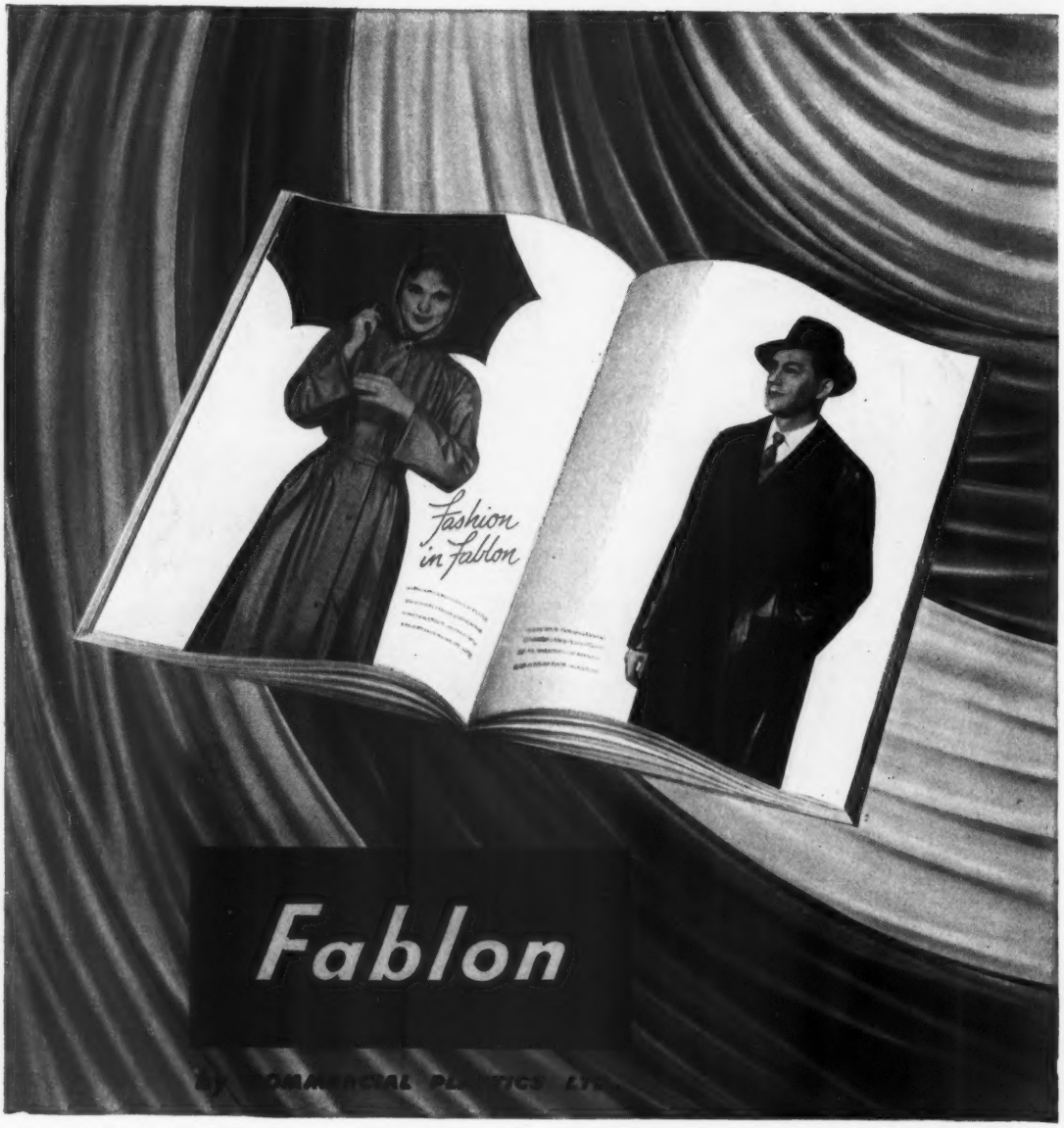

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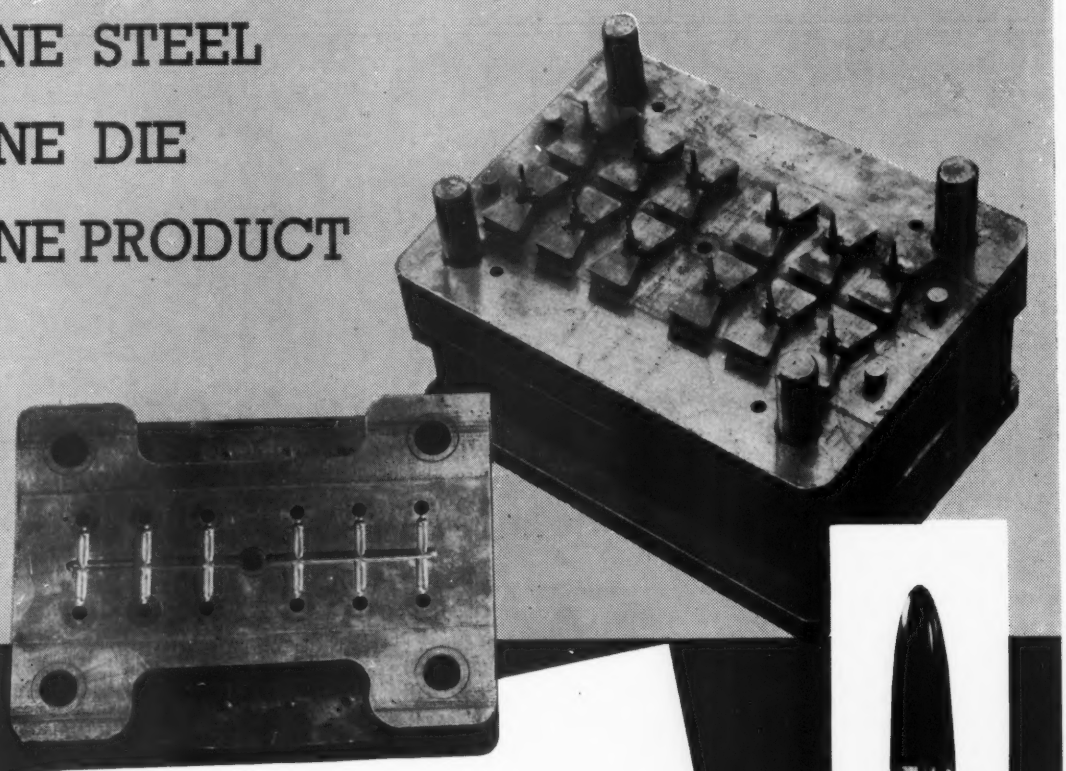

Mould for producing the end of a Ball-point Pen made in Firth Brown Nitralloy Steels—"LK3" Steel for core pin and "HCM7" Steel for sprue bushes. Photograph by courtesy of The Metal Products (Treforest) Ltd.

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for PLASTICS
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FIRTH BROWN

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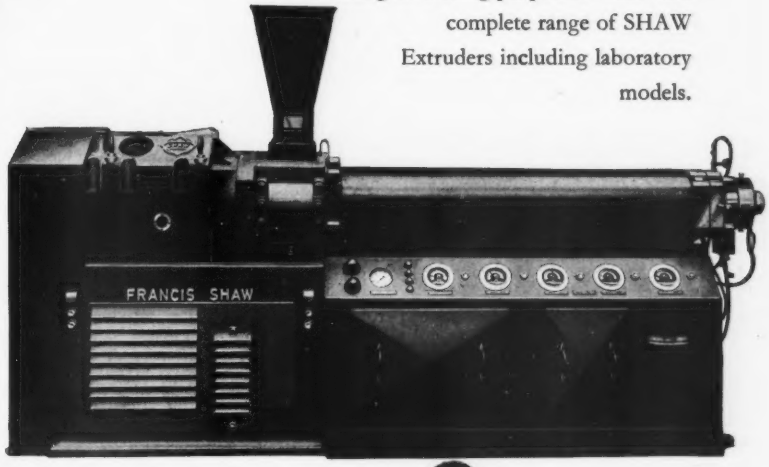

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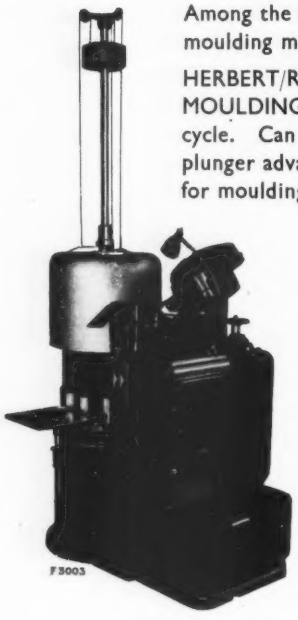

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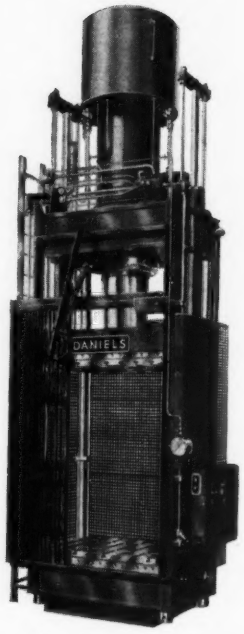
DANIELS 100-TON LOW-PRESSURE PRESS. The first of a range of hydraulic presses for reinforced plastics. Tables are 4 ft. × 3 ft. Daylight 7 ft. and stroke 4 ft.

DANIELS 100-TON ENCLOSED-TYPE PRESS. A semi-automatic press fitted with a Daniels automatic process timer to control moulding cycle.

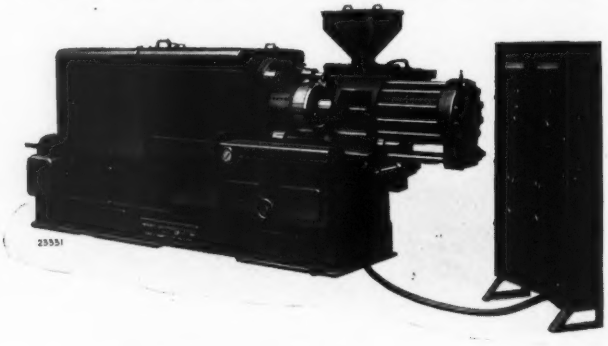
DANIELS 2B PREFORMING MACHINE. Tablets up to 1½" diameter and from 20 to 60 per minute can be produced. Handles most grades of phenolic and urea powders and certain types of melamine.

All these machines can be seen on our Stand A33 at the British Plastics Exhibition, Olympia.



DANIELS 100-TON LOW-PRESSURE PRESS FOR GLASS-FABRIC MOULDING

EDGWICK 'HY' INJECTION MOULDING MACHINE (SEMI-AUTOMATIC TYPE)



HERBERT/REED-PRENTICE 10D-8/10 oz. INJECTION MOULDING MACHINE

VISIT STAND No. A33

BRITISH PLASTICS EXHIBITION & CONVENTION, NATIONAL HALL, OLYMPIA, JUNE 8th—18th

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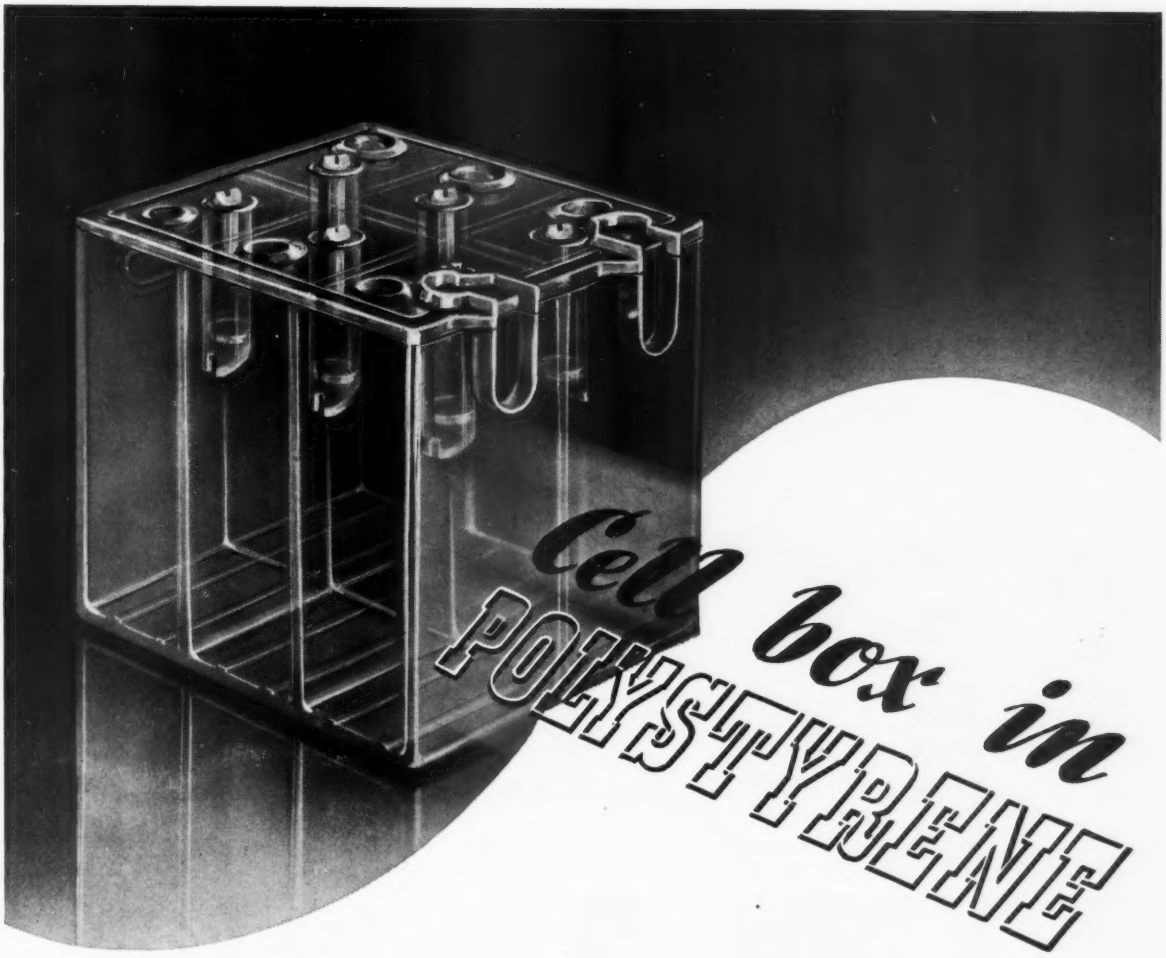

Cell box in POLYSTYRENE

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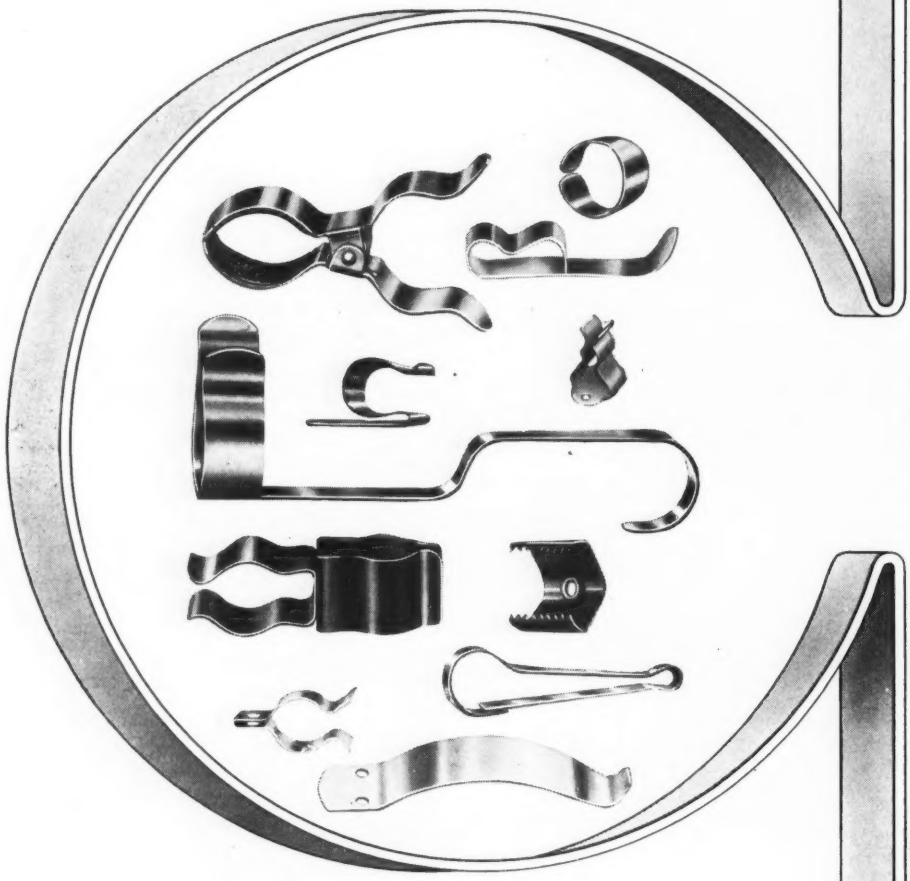

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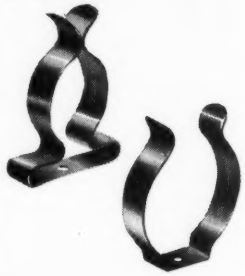
80 and 81 — general utility clips — for tool racks, etc., from ¼" to 2" from stock.



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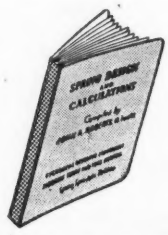

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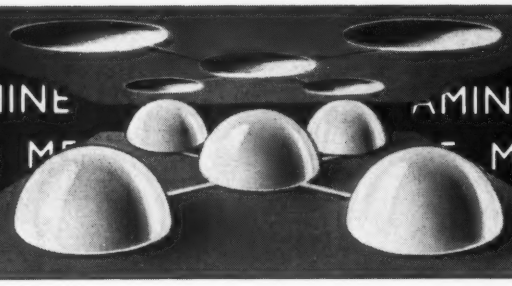

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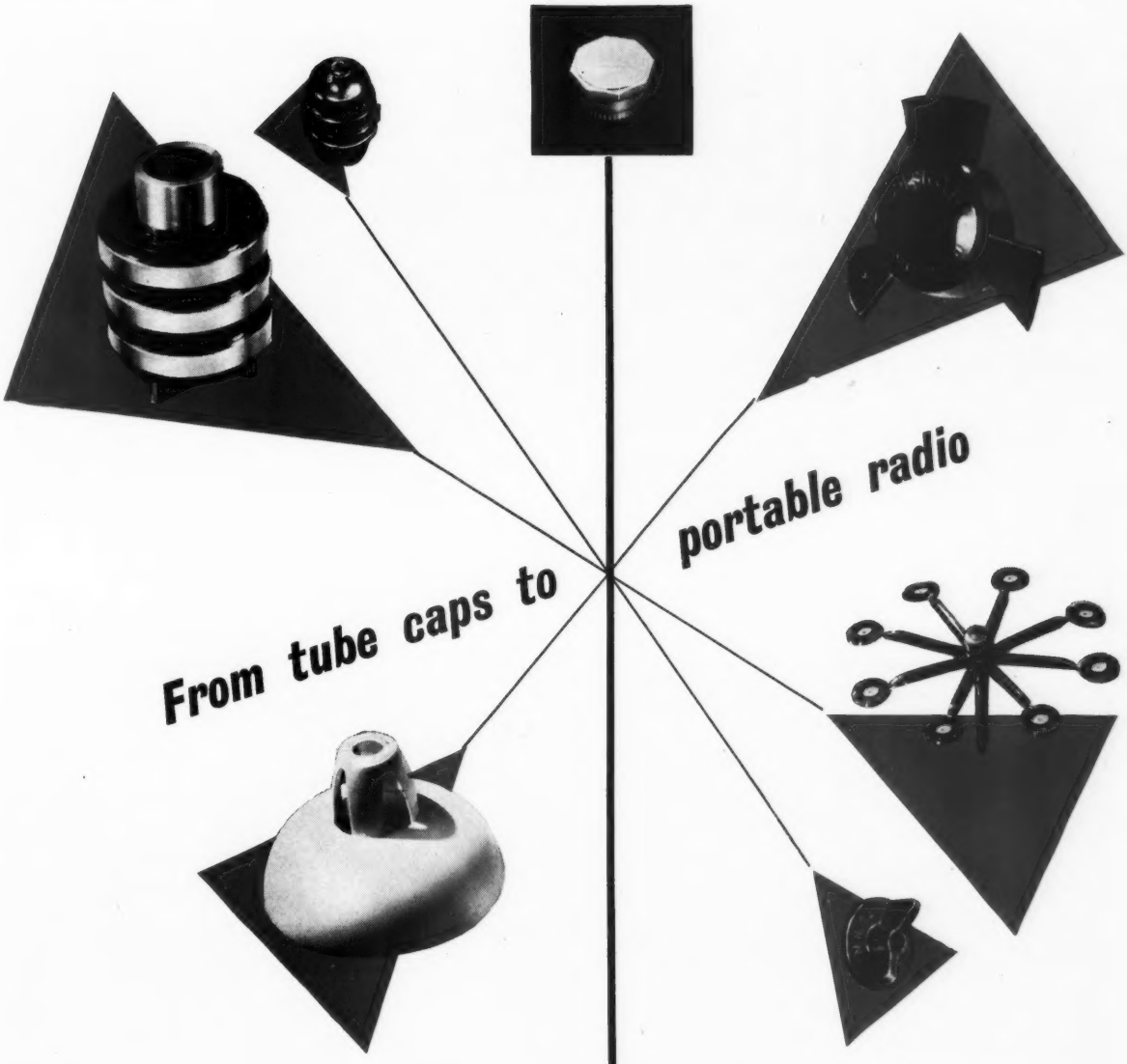

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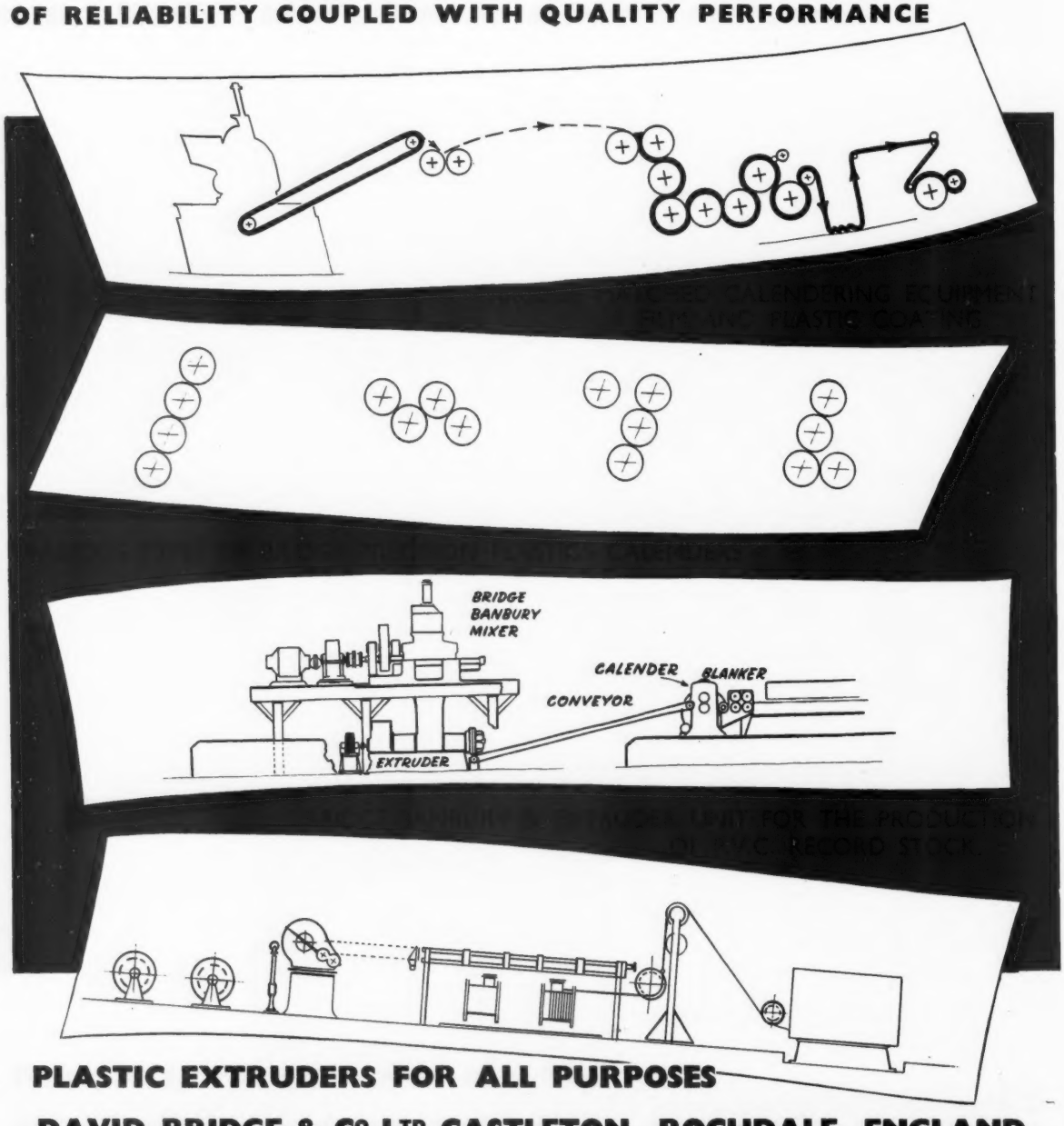

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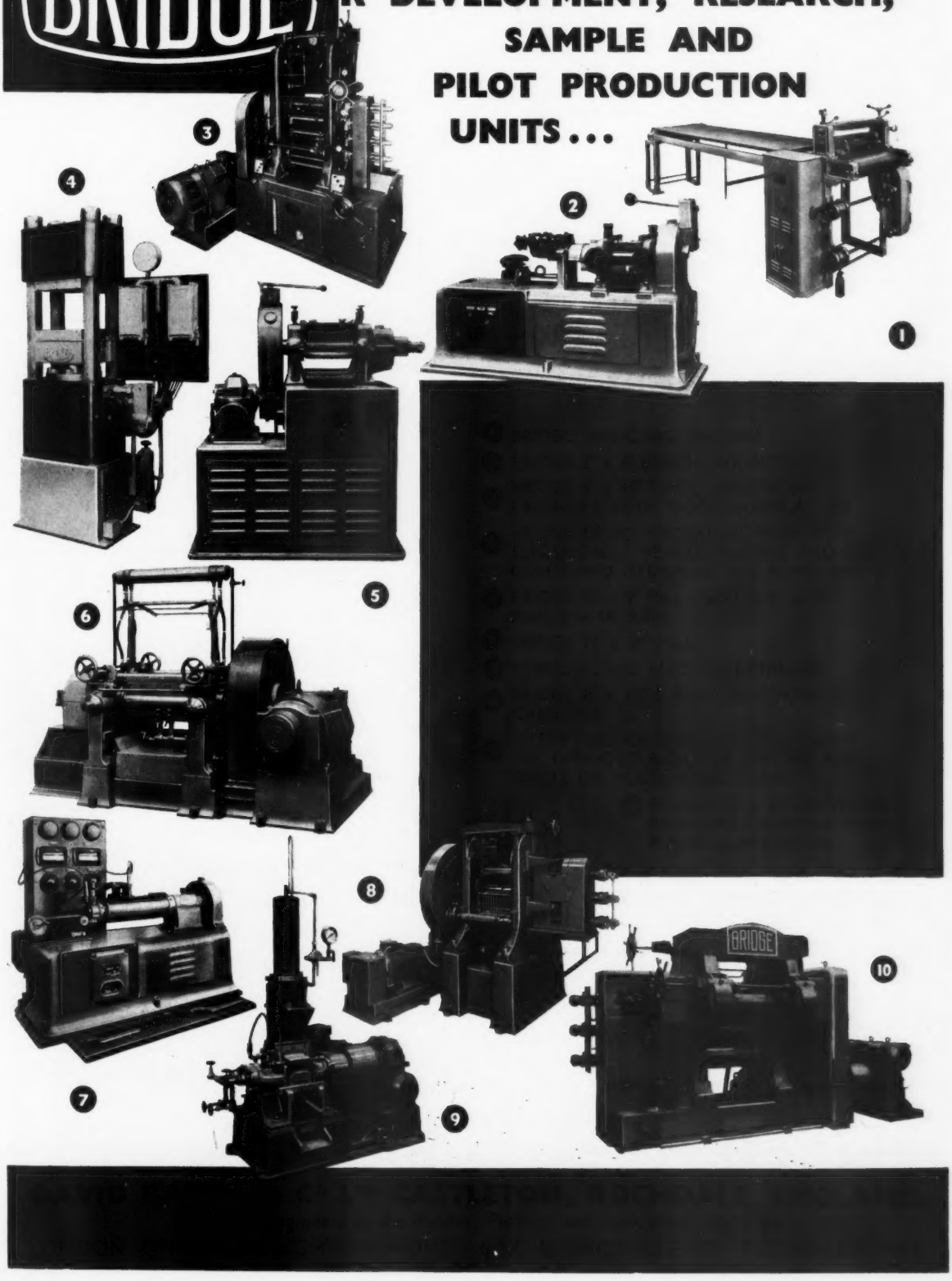

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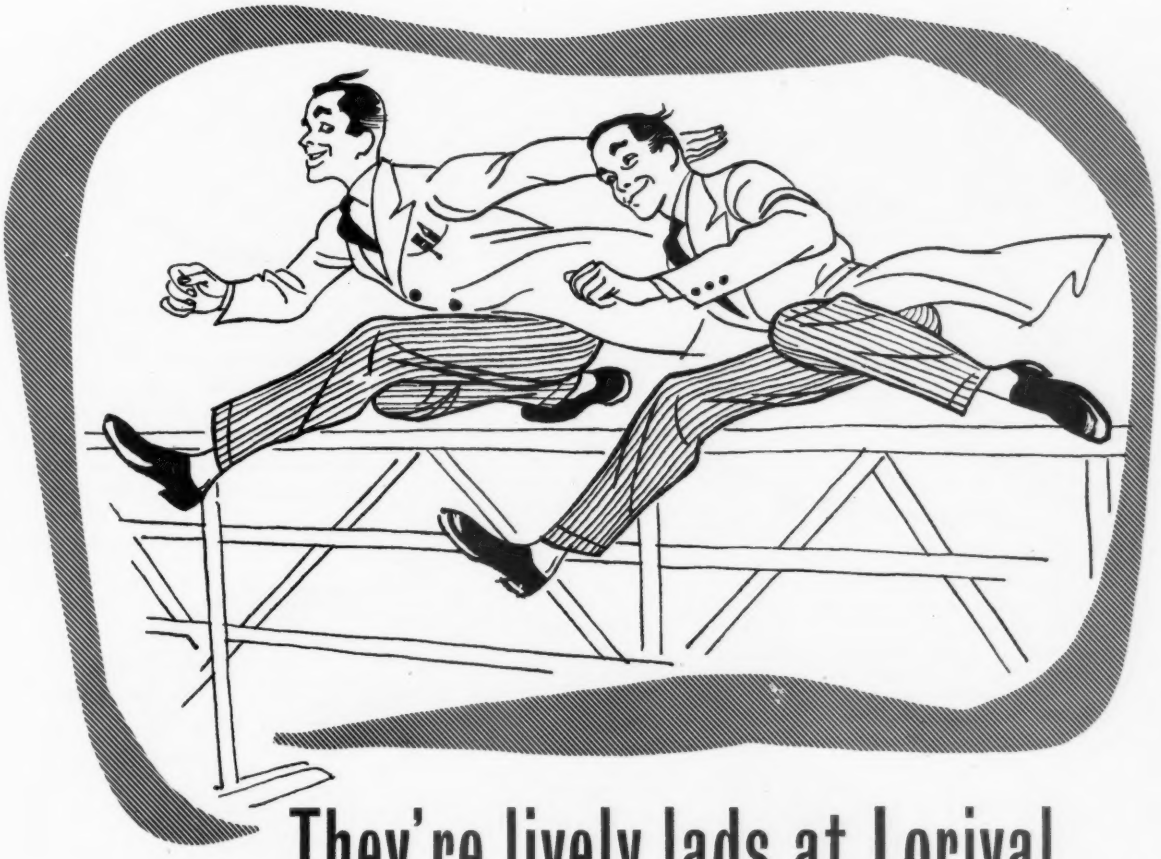

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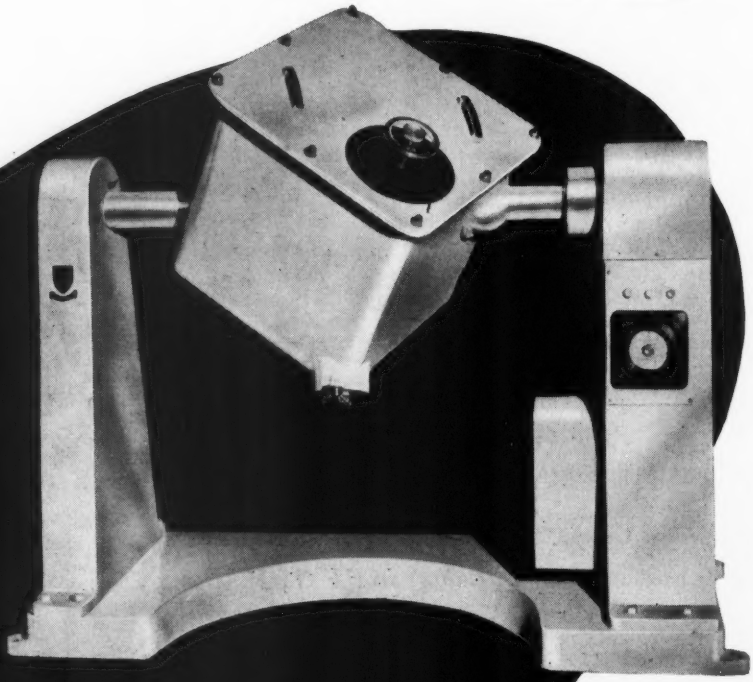

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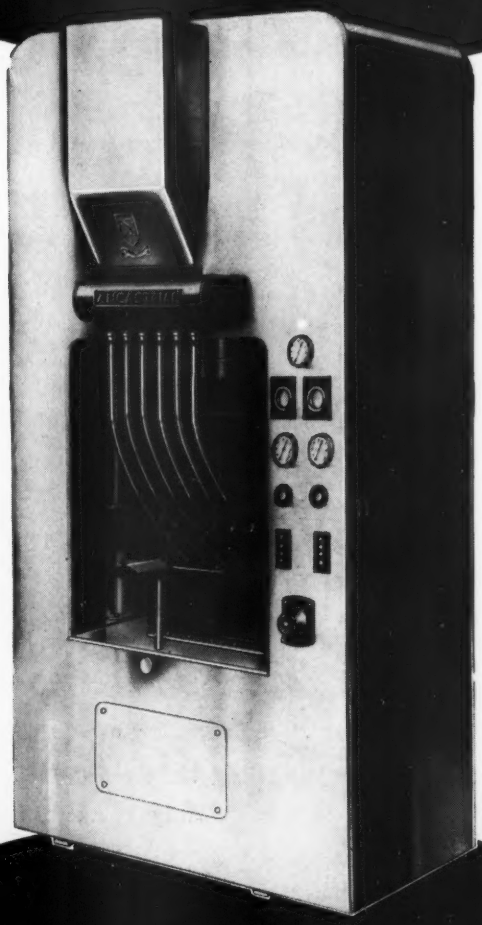

This fully automatic moulding press produces simple or complex parts at high speed and low cost, with the minimum of rejects. Fully self contained and requiring no auxiliary equipment, it is easy to instal and its special design makes it equally suitable for long or short production runs.

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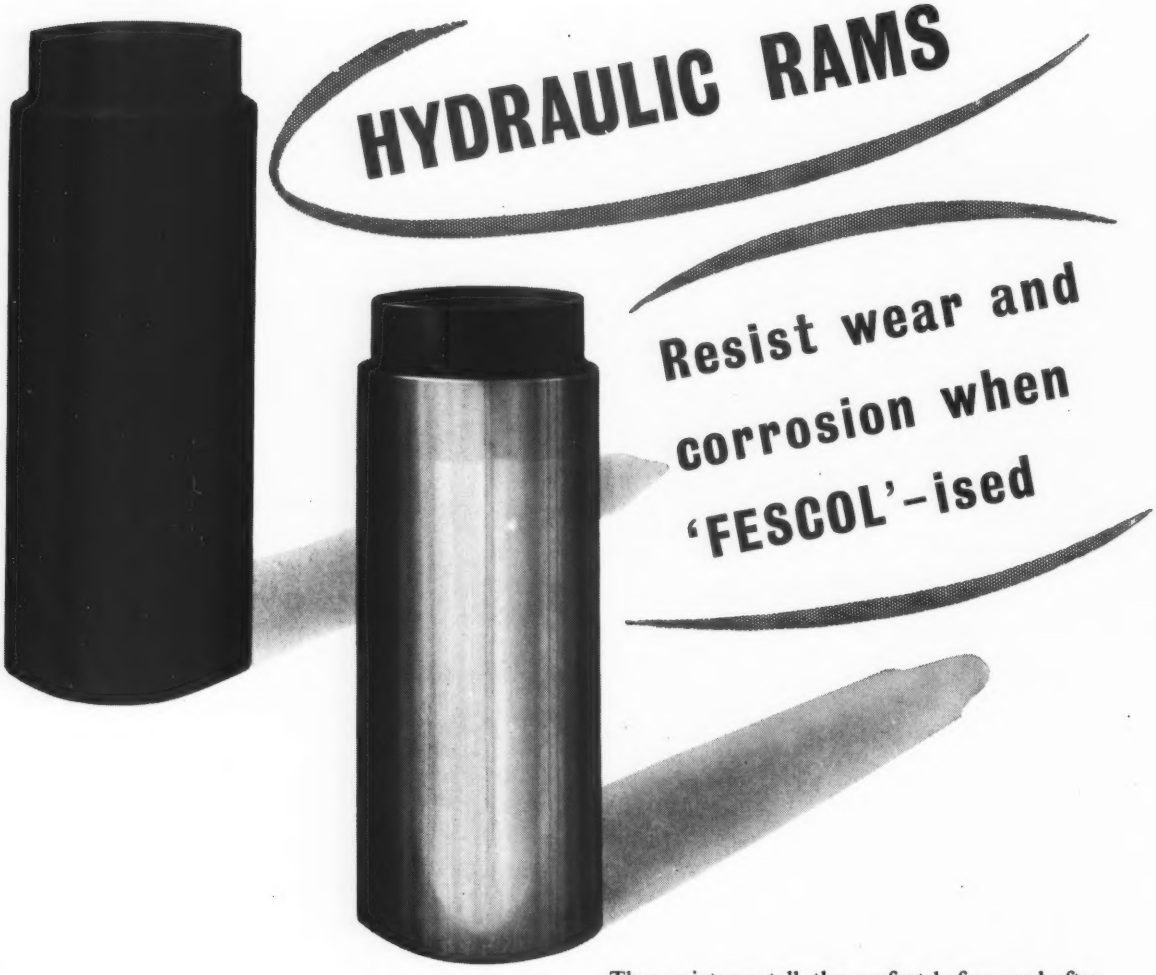
Resist wear and corrosion when 'FESCOL'-ised



The 'Fescol' process consists of the electrolytic deposition of a heavy layer of nickel or chromium on the bearing surface, and subsequent machining to size. The Process is applied to worn Rams, but it is recommended that it should be carried out before the Ram is put into service. The choice of a nickel or chromium deposit depends on individual working conditions, and we shall be glad to give advice and make recommendations. Executives are invited to write for List P1169, which gives details of the 'Fescol' process, and examples of many applications for which it has proved beneficial.

These pictures tell the perfect before-and-after story of the 'Fescol' process for hydraulic rams. The photograph on the left shows an untreated ram which has become corded and pitted by wear and corrosion. In this condition it has reached the end of its useful life.

But take a look at the right-hand photograph. This ram has been 'Fescol'-ised and will retain its shining newness almost indefinitely. That is because the nickel or chromium protection provided by the 'Fescol' process withstands wear and corrosive attack, being an even harder, more durable surface than the original metal.

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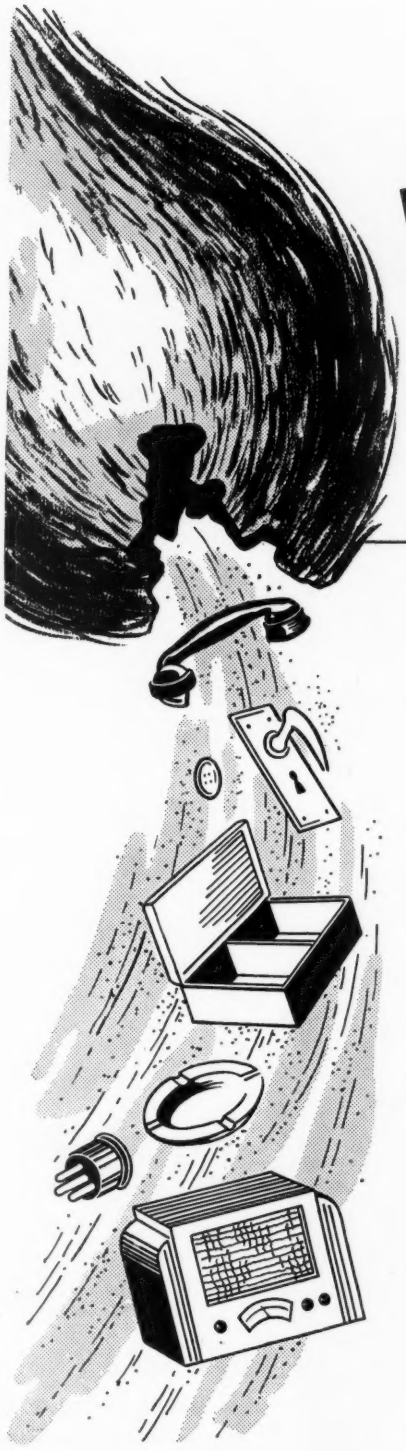

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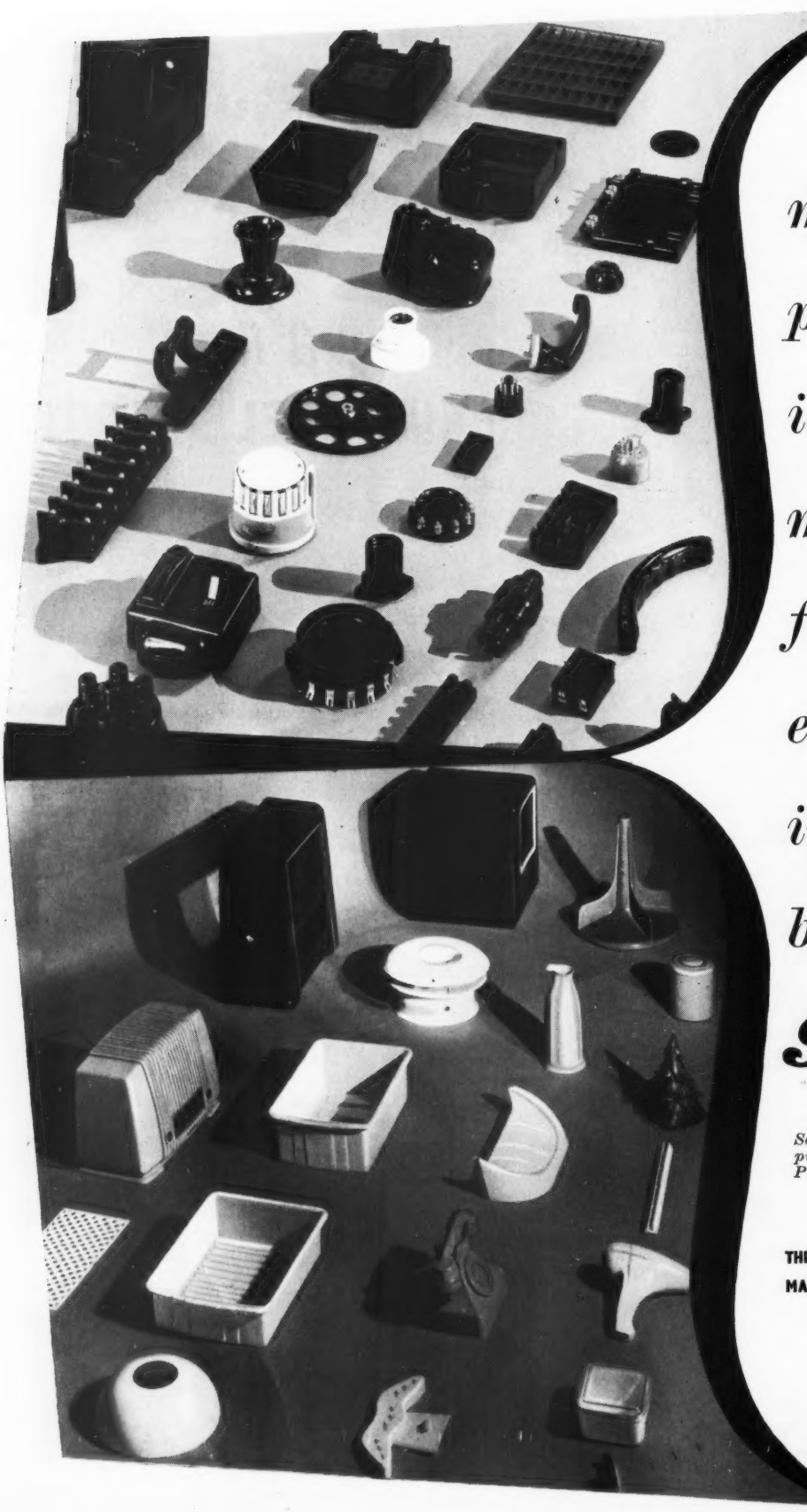

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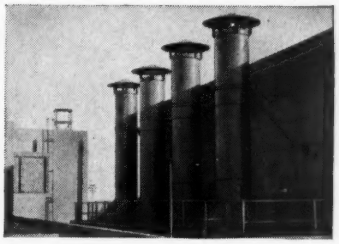

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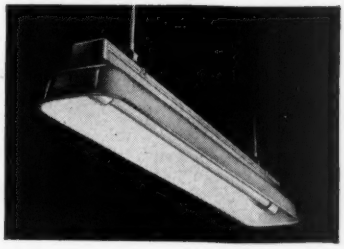

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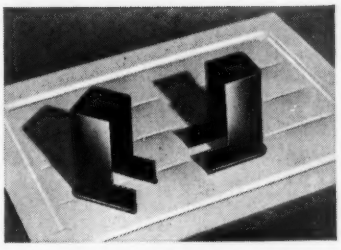

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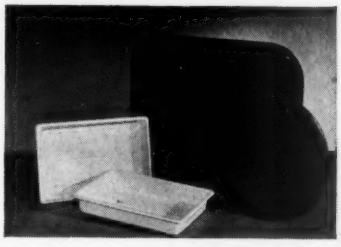

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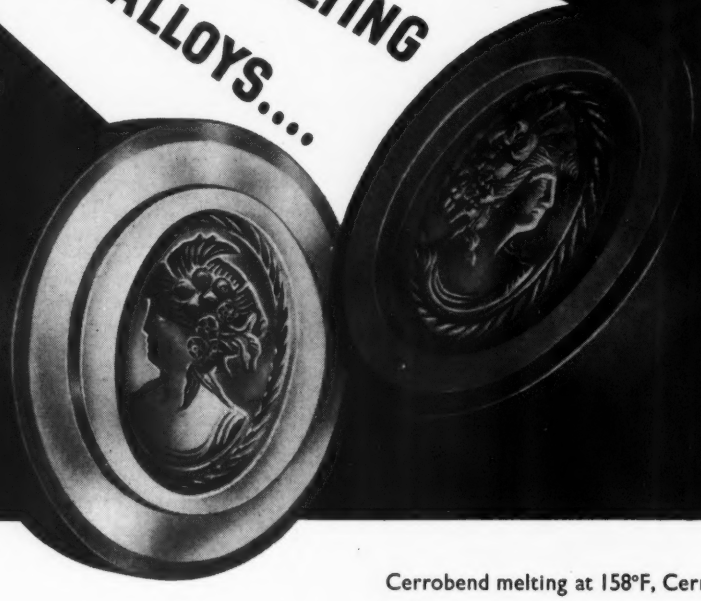

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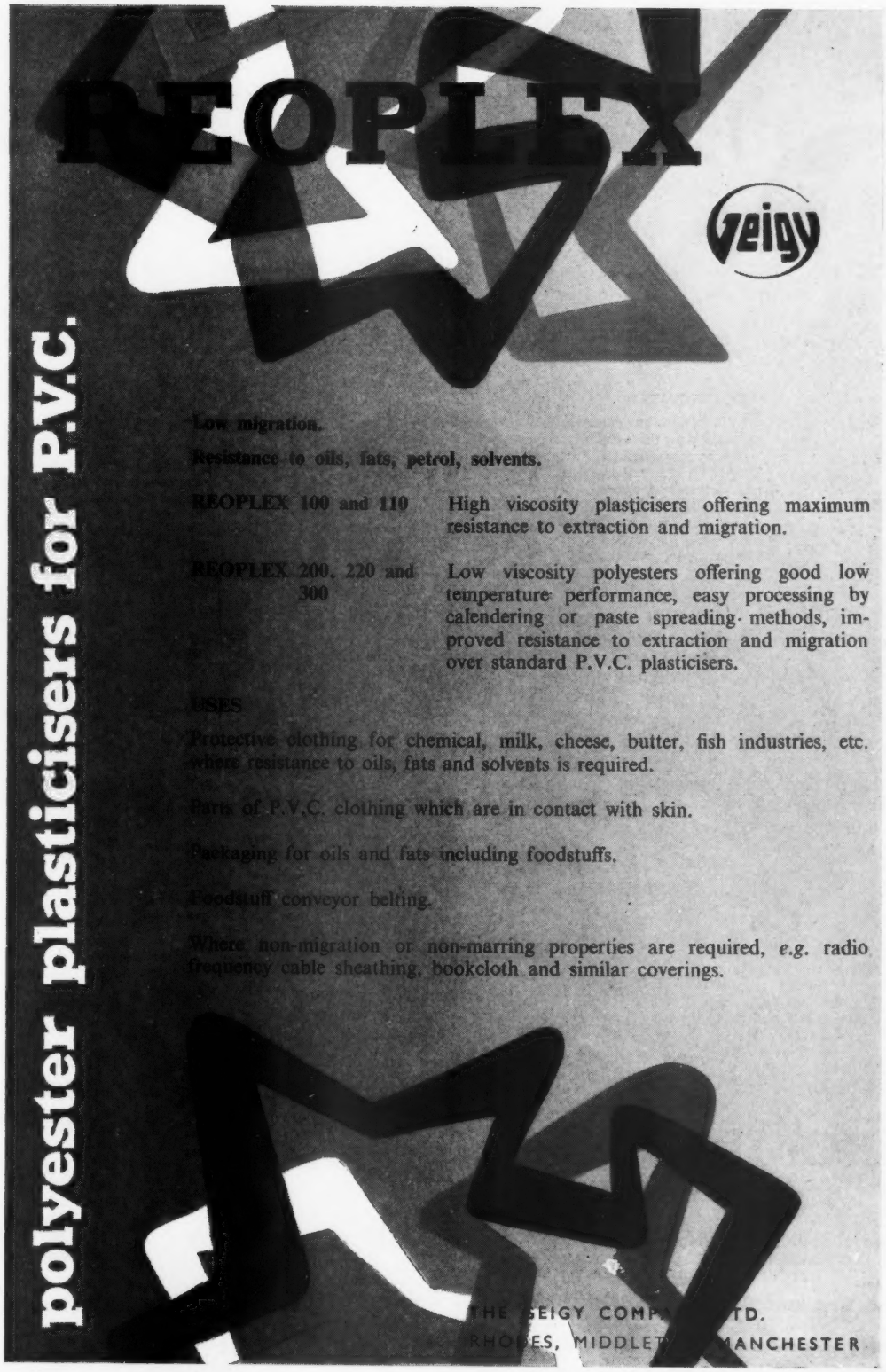
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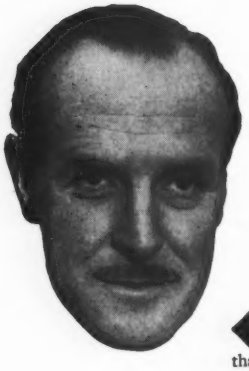

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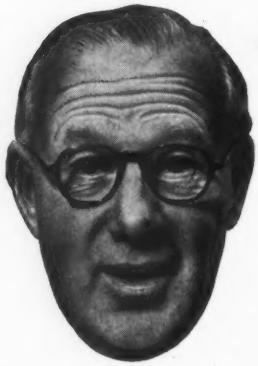

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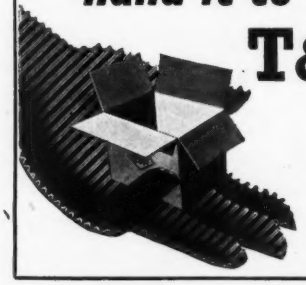

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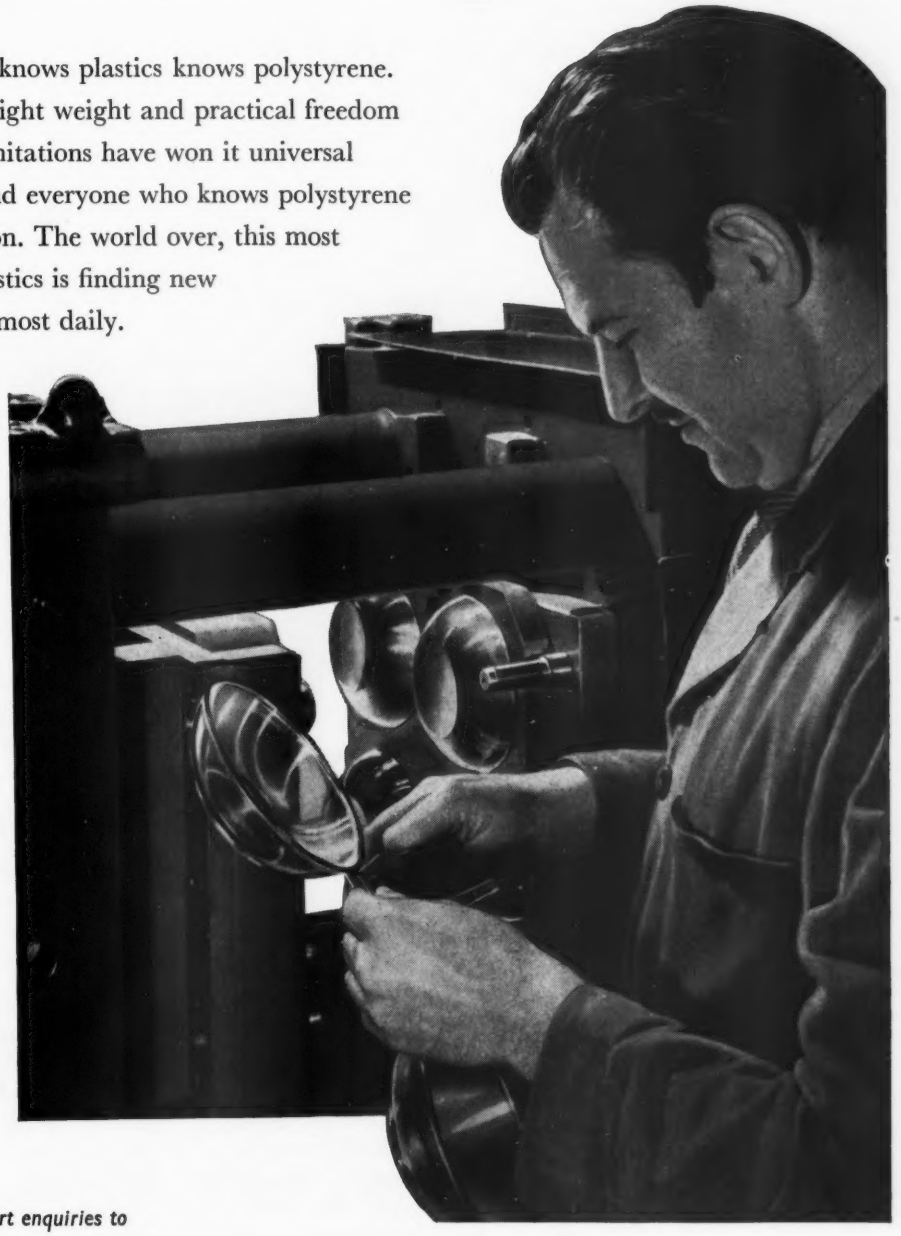
Everyone who knows plastics knows polystyrene. Its cheapness, light weight and practical freedom from design limitations have won it universal acceptance. And everyone who knows polystyrene knows Kleestron. The world over, this most versatile of plastics is finding new applications almost daily.



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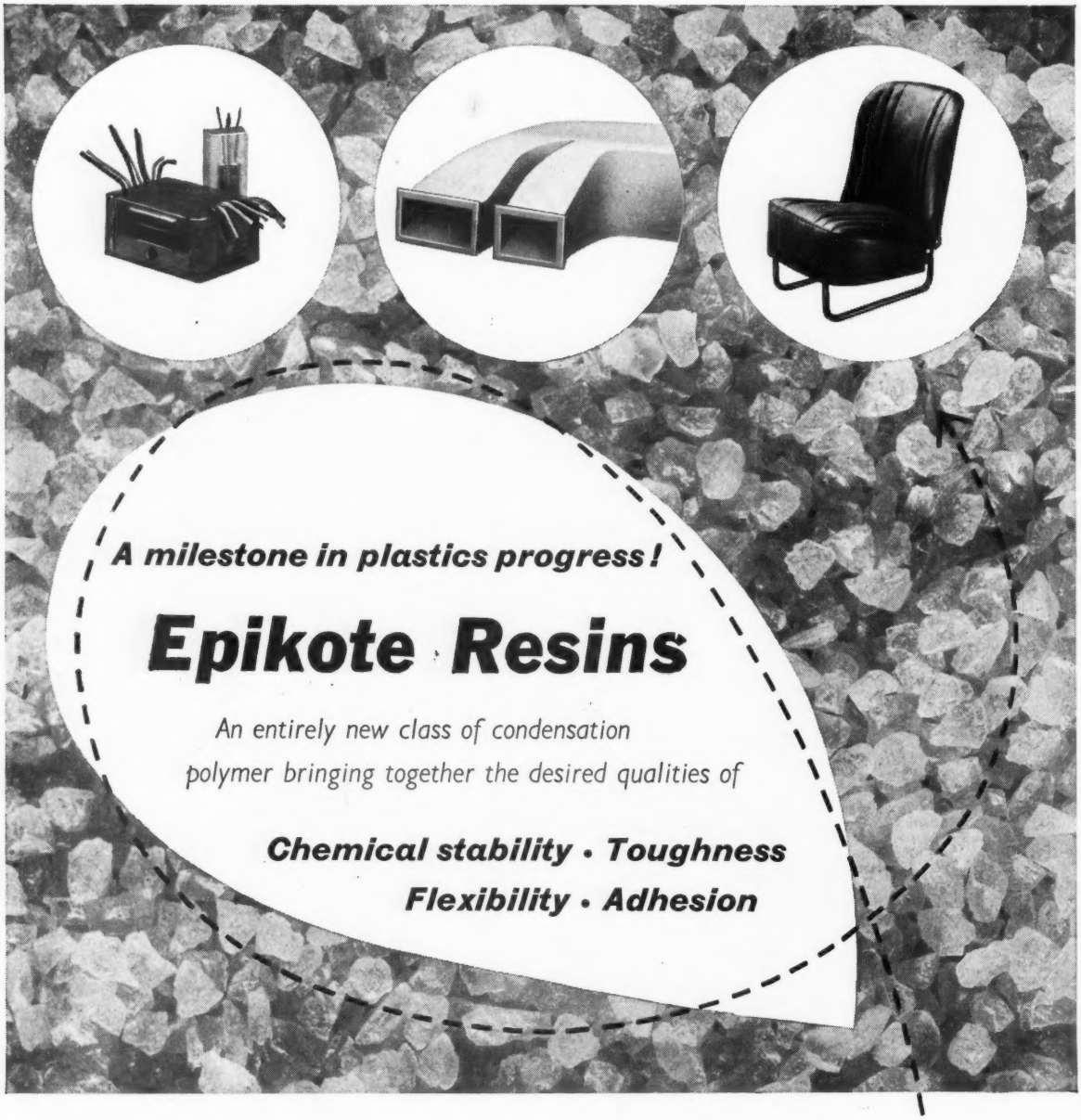

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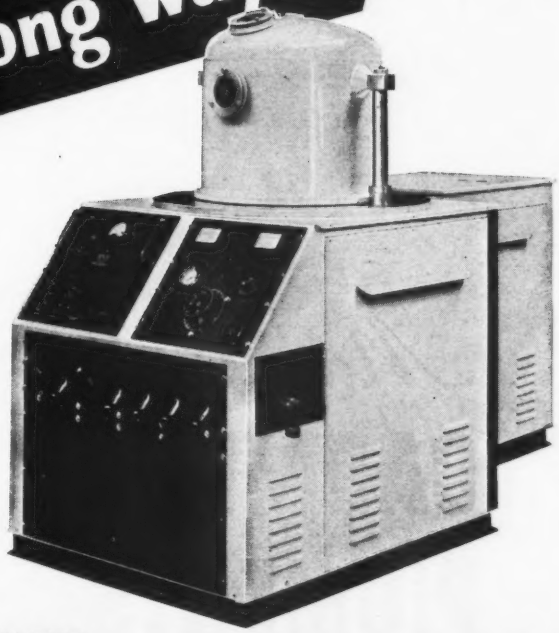

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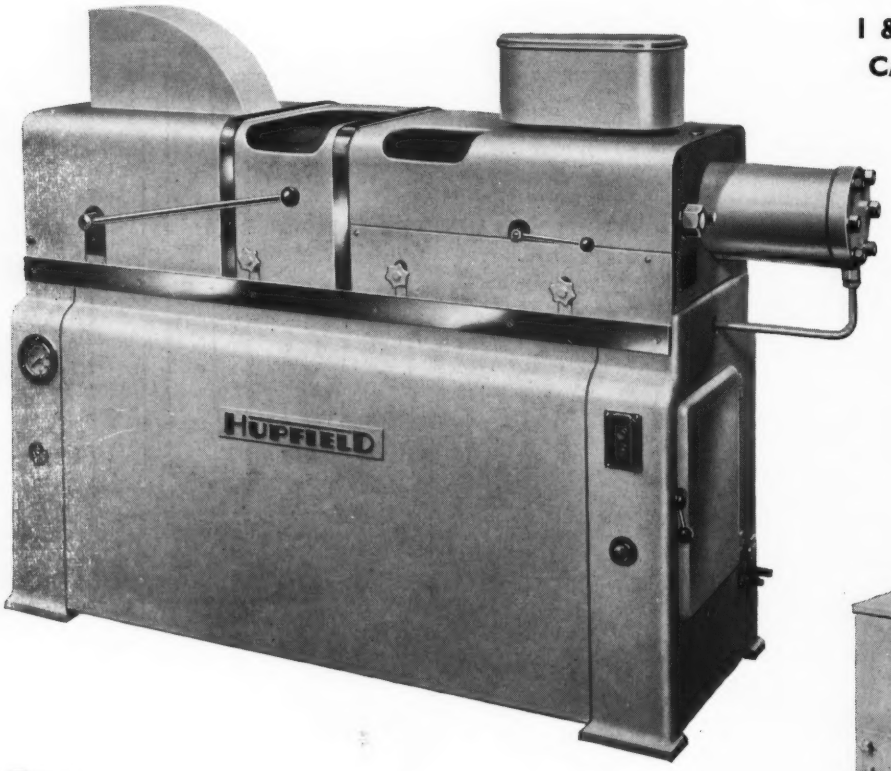

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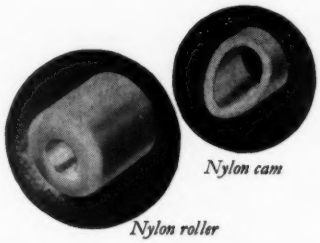

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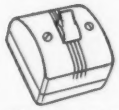

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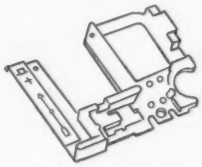

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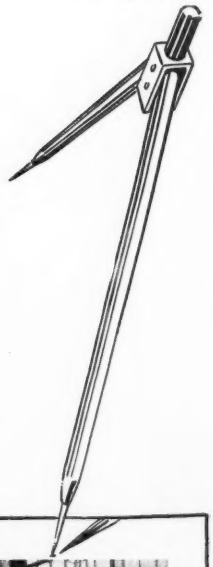

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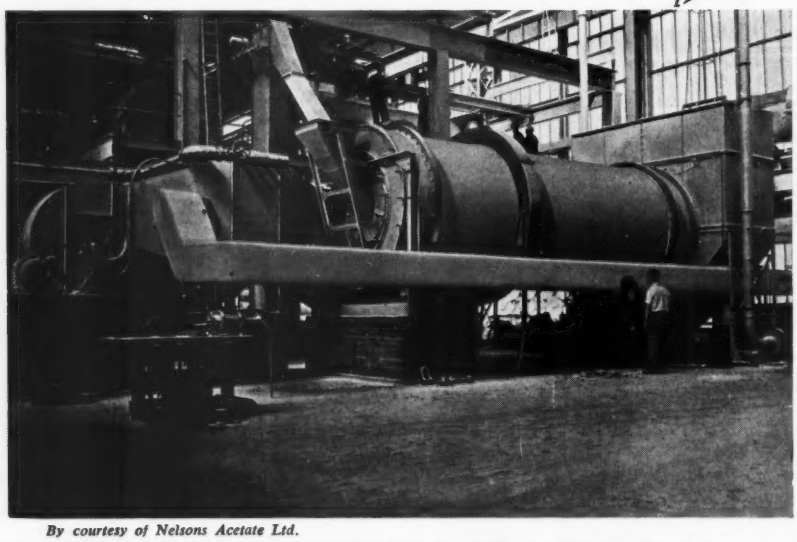

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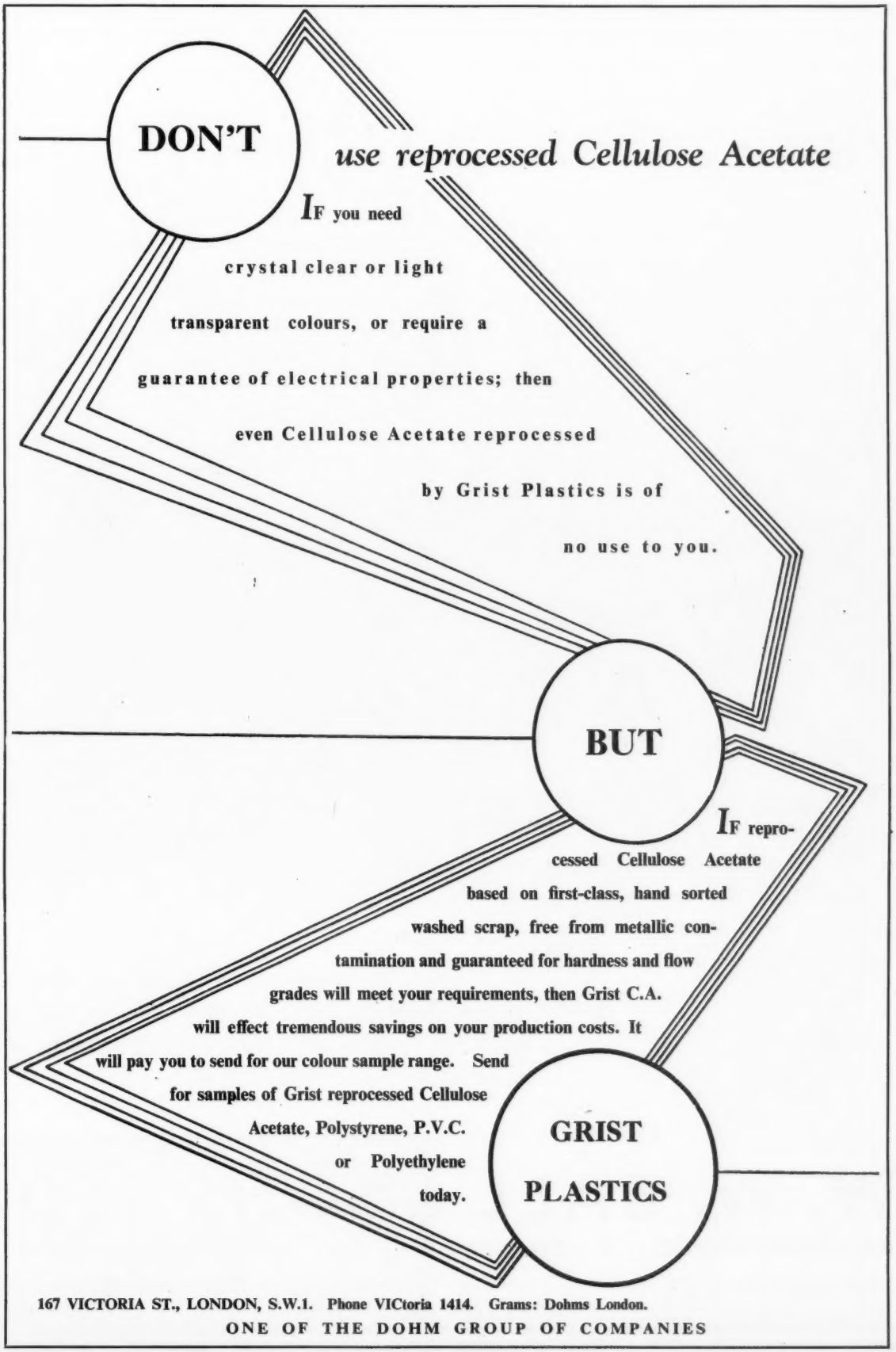
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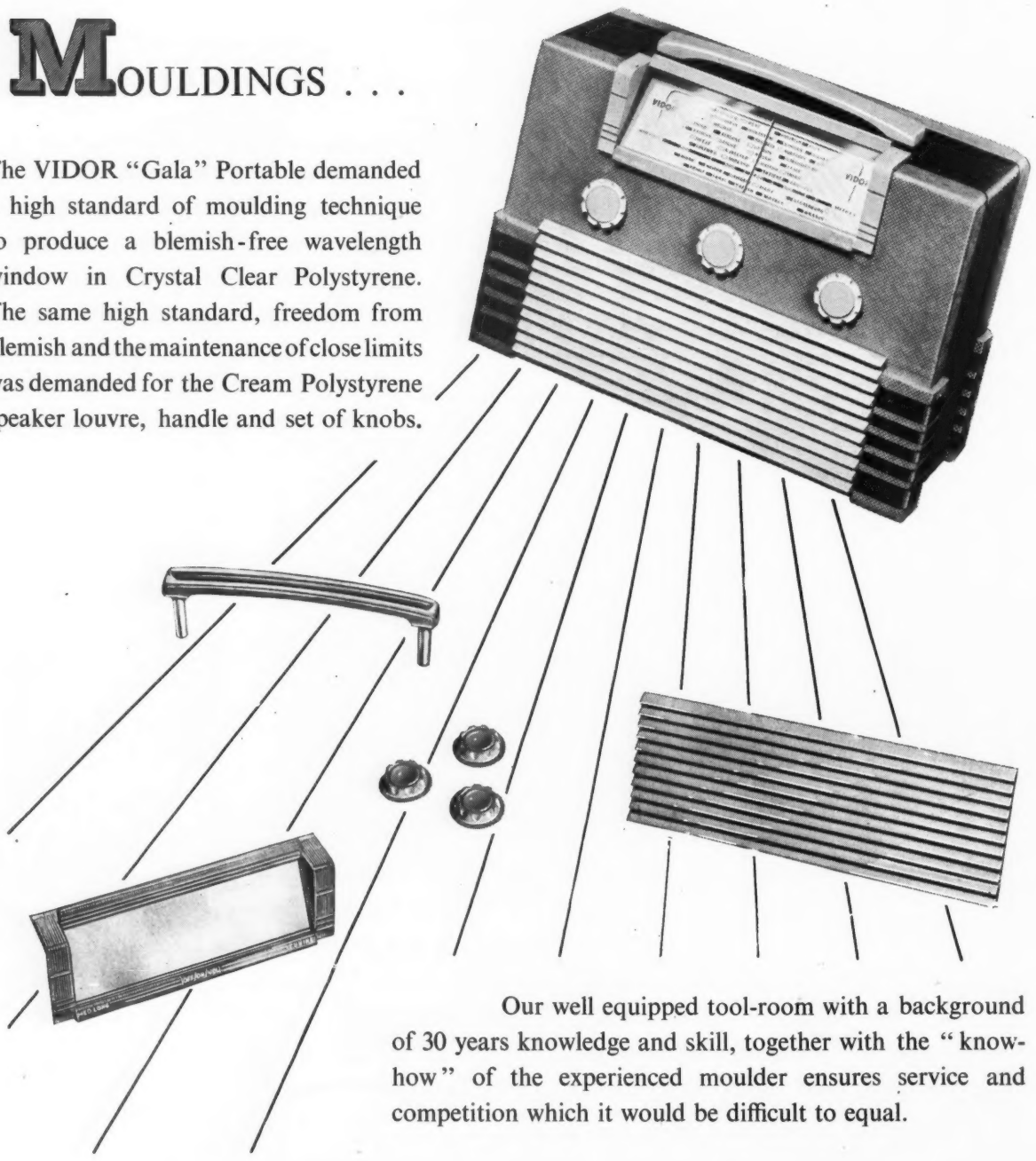

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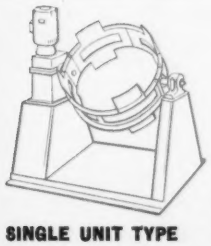
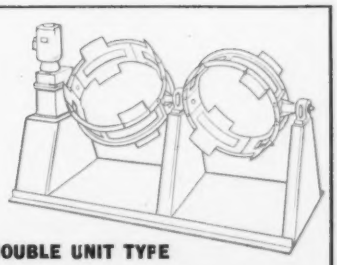


SINGLE UNIT TYPE



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The extremely wide colour range is only one

of many qualities which attracts so many

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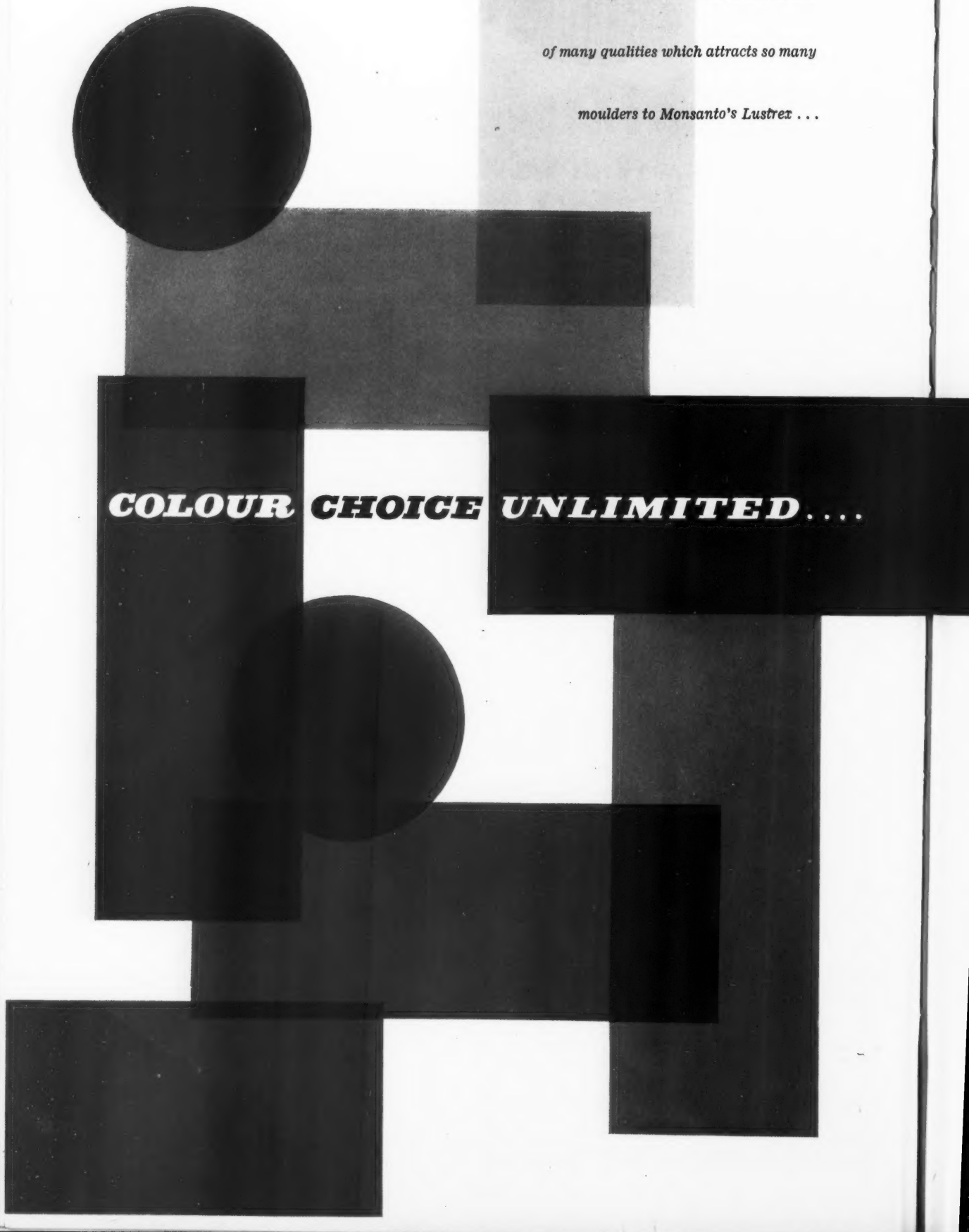

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mouldability

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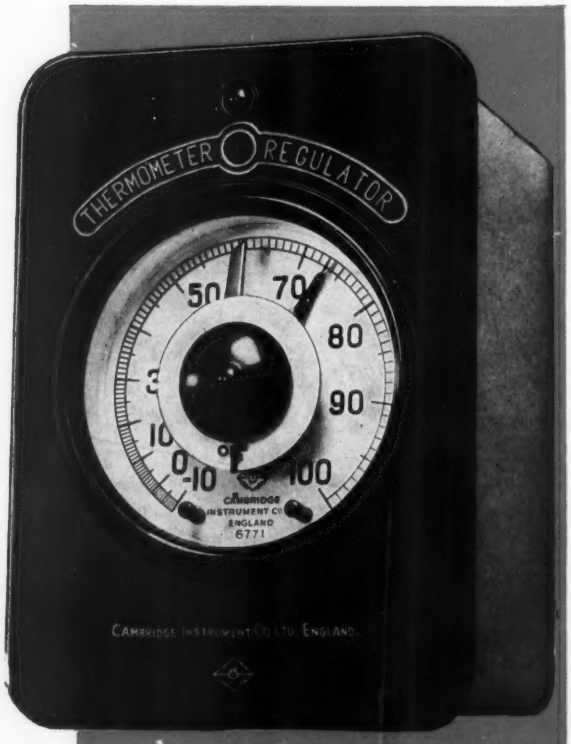

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Plastics

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EDITOR: M. D. CURWEN, B.Sc., A.R.I.C

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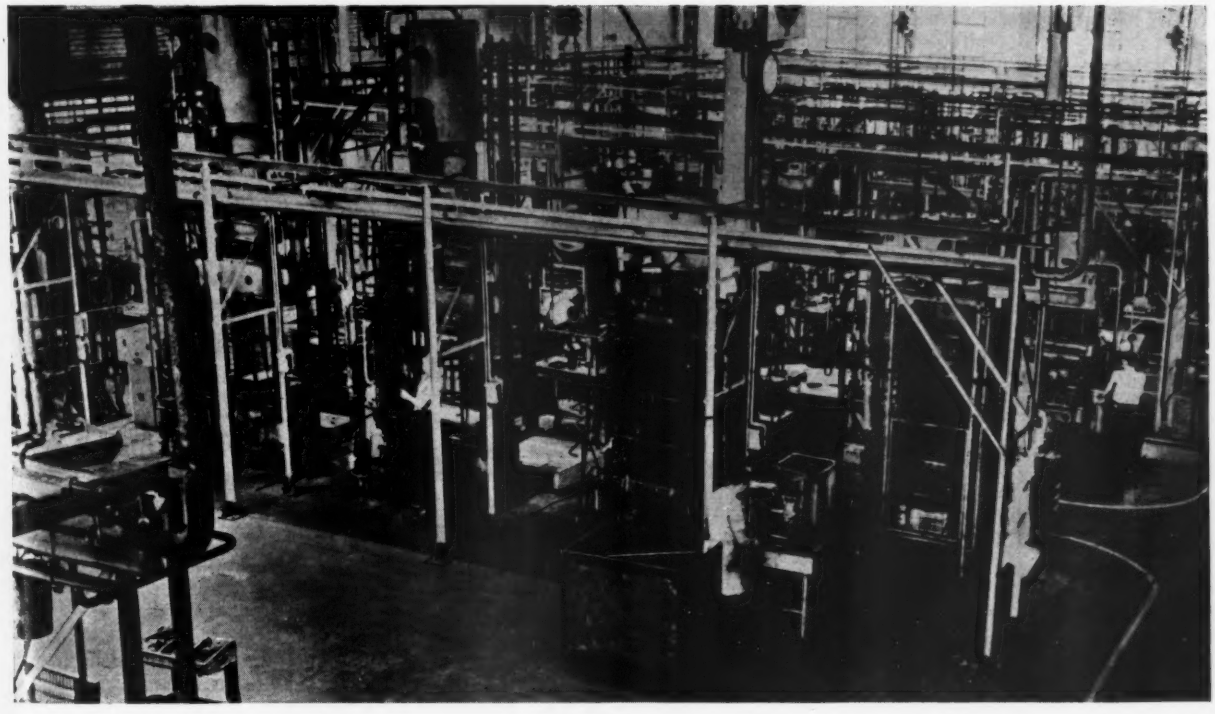

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TWO NATIONAL PLASTICS COMPANIES

Plastics

VOL. XVIII. No. 191 JUNE, 1953

Elizabeth R
1953

ALL of us, we should imagine, were profoundly moved and made happier by the events of the past week when our Sovereign was crowned — a symbolism that is part of our history, our laws, our lives.

On these occasions, the British nation is swayed by a deep emotion, so rarely comprehended by those who do not know us—an emotion springing from the understanding that the Sovereign's crowning is a dedication of complete service to the people for the duration of his or her life. We believe it to be as simple as that.

In a world where most rulers are on the stage for but a few years we are thankful for a system that keeps us continually mindful by example that service and self sacrifice is the greatest attribute of civilized man.

It is remembering this, that we join with our readers in all parts of the British Commonwealth of Nations in tendering our loyal greetings to Her Majesty Queen Elizabeth, on the occasion of her Coronation.

Our thoughts also go out to her husband, Prince Philip, Duke of Edinburgh, who has caught the public imagination as no other consort in history, for his manliness, understanding and ability: as a Kingly man who will walk with her and sustain her along the difficult road in the years that lie ahead.

EDITORIAL

The British Plastics Exhibition

THE happiness that has swept over the whole country on the occasion of the Coronation is now followed by the more earthy satisfaction of the largest exhibition the plastics industry has ever held. We believe that by dint of hard experience during the past 20 years or more, it has learnt to create a shop-window that, with its continually expanding range of raw materials, its ever-widening fields of interest and markets, and the excellence of its presentation, surely surpasses most other industrial shows. Its very kaleidoscopic nature is a continual source of wonder to the outside observer.

The present second exhibition of the British plastics industry as an entity entirely divorced from the British Industries Fair was created by *British Plastics* with the active participation of the British Plastics Federation; it follows the principle of segregation from other industries practised in the U.S.A. and in Germany. By this means the full light of publicity is concentrated on our own technical endeavours and it is hoped thereby to obtain results which were not generally obtained at the B.I.F.

It will be a long time before any sort of assessment of the value of such exhibitions can be arrived at from the point of view of hard cash, which after all is the only tangible yard-stick we have. But at any rate the British Plastics Exhibition of 1953 has already increased the number of stand-holders over that of the 1951 Show, when about 86 were present. There are now some 92; some 35 names have dropped out but 40 additional ones have appeared.

While it is regretted that fluctuation in the number has taken place, which may be explained by the recession of 1952 and by the fact that the 1953 B.I.F. has just ended, yet the hard core of exhibitors remains almost unchanged. It is worth remembering that the first appearance of finished goods in plastics in some semblance of a group took place in the B.I.F. about the year 1927, and it was then only as a small part of the large chemical industry's section.

But it is not in mere size that the present Show is significant. For those who run and see and who have attended previous Exhibitions, the movement and changes in the plastics industry are more clearly visible than in years past. The first article "The Next 10 Years" we publish in this special issue as a sort of foreword to the details of the Exhibition itself, tries to stress the effect the new materials and new products will have in the immediate future.

The results of the Exhibition in terms of real hard business cannot but help being an unknown quantity, but of the value of the Plastics Convention, which accompanies it, there can be no doubt. The disclosure of technical progress made in the past few years in our industry is eagerly awaited.

We had hoped that advantage would have been taken of the great influx of visitors from all quarters of the country and from abroad to show them also what we have done. We speak of the public and not of those technical overseas visitors who come to see what new raw materials and machines we can offer and which they are ready to buy, and what is new in finished goods but are not so ready to buy since they hope to make them themselves.

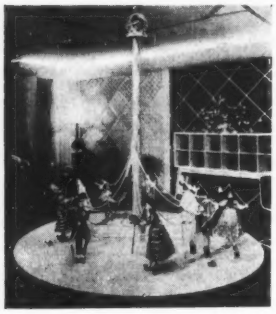
We can scarcely be said to export (other than as components in non-plastic structures) a really satisfactory quantity of finished goods except of special type.

We have a vast market in our own country for consumer goods and yet we make but a half-hearted attempt to attract the public whose custom we want—indeed, their presence appears to be resented. It is a queer way of spreading the gospel of plastics and of getting new business.

MOULDING POWDER AND SHOT

I should like to congratulate two concerns who added a great deal of gaiety and charm by their exhibits at the British Industries Fair. Both Dunlop Special Products, Ltd., and Storey's of Lancaster, whose manufactures of p.v.c. sheeting are quite superb, lead the way in designing stands for attracting visitors in a manner that has not, I believe, been surpassed. Storey's colourful, crowned maypole was a sheer delight with circling puppets dressed in the latest designs of "Storeen" and "Storaya" prints while Dunlops transported us to a sun-drenched café scene in Paris. I must say I can't blame the

This is More Like it

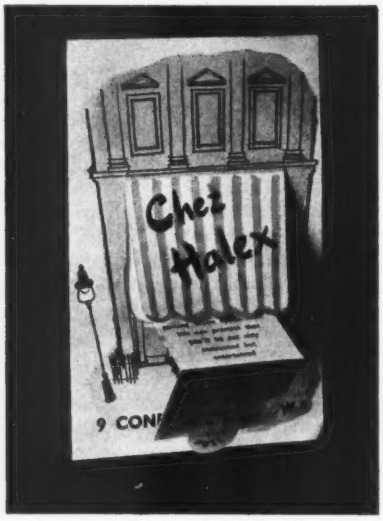


fellow in the right-hand picture for forgetting to take off his raincoat—the eyes of the lovely lady must have shaken him somewhat.

* * *

Halex, Ltd., has also paid a graceful compliment to our noble allies across the Channel with a clever invitation to that company's new showrooms in London at 9 Conduit Street, W.1. As will be seen it included a colourful sun-blind and a pull-out with "menu" and times of opening. We need a lot more of this cheerful stuff to help our imagination, to bring in the customers and to warm us during winter days, to say nothing of spring, summer and autumn. It is also good, I'm told, for international relationship although I don't know that the French respond very heartily beyond a few sporting words such as "futbol," "noque-oot" and "le five o'clock" (tea).

And So is This



In the lovely halcyon days of 1939 I could send my only shirt to the laundry with the certainty that, while it might have been returned to me with the teeth-marks of the laundry's special grinding mills on it and with the fabric somewhat dissolved in the sodium hypochlorite they used, at least it came back, for the price of 6d., looking rather self-conscious and reposing in majestic solitude in a strongish vulcanized fibre box. Today it costs me 1s. 6d., and the same shirt (really its great-grandchild) is returned, with the same teeth marks it is true, but in a miserable bit of thin brown paper tied round with ragged string, and with the collar looking as if it had passed through a Shaw (or Mason or Windsor) extrusion machine. Now, there is a Laundry Research Association which has existed for a long time and while no doubt it has done much to advise the laundry industry on scientific and technical problems, surely it could also act as a liaison with the plastics industry to devise a strong, semi-stiff box that would withstand the racket of transport. I am sure that with careful thought one could be made without the necessity of leather belting and metal buckles. I visualize a "suit-case" form, a single moulding rather like the polythene spectacle case made by Moulded Products, Ltd. (*Plastics*, December, 1952), and closed by press-studs. It would need a larger mould!

The Mills Grind Slowly

* * *

On opening my April 16 number of *Country Life*, I was delighted and horrified to find therein a fascinating article entitled "A Forgotten Plastic"; delighted because it is good to know that a famous paper such as *Country Life* is deeply conscious of the plastics industry and horrified that the staff of this journal (are they dead or do they but sleep?) had missed a nice story for the delectation of its readers, since it dealt with the production of lovely plaques of "bois durci" made in France in the middle of the 19th century and later in this country from sawdust and blood albumin. To rub it in, other journals (including one well-known technical journal) hastened to copy the article from *Country Life*, or to make their own interpretations of it. Dogsboddy had let you down again! But stay, where had I seen the noble aquiline features of the Emperor Napoleon before? Surely not in the famous Royalist pages of *Plastics?* Yet so it was, and as I turned back the pages of history, of this journal of June, 1939, there it was, the whole story, and the picture I give below. To cap it there was also later, a letter from my old acquaintance, Monsieur Forres, of the famous French company, Manufacture d'Isolants et Objets Moulés, telling me that they had moulded thousands in the 19th century, and yet another from an English schoolboy Mr. Brian Hills, who sent me one of the "bois durci" plaques of Beethoven made here in 1880. Brian Hills would be amused with the foregoing and I hope he is here to read it. But it makes you wonder if . . . well, let sleeping dogsboddies lie.

Thirst for Hot News

DOGSBODDY.

The Next Ten Years . . .

The Editor of Plastics *recently had the honour of being asked to contribute an article with the above title to a special issue of* The Director *published to mark the Golden Jubilee of the Institute of Directors. The article was one of the thirty-three contributions under the general title of "The Next 10 Years in British Industry." It is significant and pleasing to note, that in his foreword in this special issue of* The Director, *the President of the Institute, Major-General Sir Edward L. Spears, remarks: "The decision to focus attention on the next 10 years in British Industry rather than to discuss the past is . . . a wise one. For plainly these will be momentous years during which the commercial and industrial fate of this country could easily be settled. And it is right that we who bear the responsibilities of leaders should be forward looking and ready to adapt ourselves to the developments which are in store for us."*

These words by a famous fighter who has spent his life in the service of his country and who now speaks for 7,000 directors of well-known companies, are also the words of wise statesmanship, for which the plastics industry will be grateful. The expressed desire to examine more closely our work and our aims by such an important group whose influence may be profound, is doubtless the result of a direct evaluation of the importance of plastics in the country's economy. If our notes, which we hope our readers will approve, make even a small contribution to a clearer understanding of the path we are making, we shall be well content.

The occasion of the British plastics industry's own exhibition takes place in a year of high-level technical advancement. It seems appropriate therefore to restate the case we made to our own circle of readers. We have obtained the permission of the Editor of The Director *to do so and present it herewith.*

THE PERIOD WE ARE ASKED TO UNVEIL permits of no fanciful dreamings. It is a section of our future, inescapably bound to our present and past discoveries and labours. Any new and important discovery of tomorrow would probably take more than 10 years to develop scientifically and technically to reach the world's markets and therefore has no place in what follows, even if the human mind were capable of guessing at it, which the mind is not. The plastics industry may be considered as being no different from any other. Its raw materials must be converted into finished goods by some form of energy and the finished goods must be sold. However, the plastics scene is in many ways so structurally different from any other that a detailed examination is necessary to see how it has arrived at its present form and where it is going.

Its basic raw materials, e.g. cotton, wood, casein, coal and petroleum, are all organic in character. Of these the most important economically are coal and petroleum, and the plastic materials derived from them are pre-eminently synthetic, having been transformed from the simple gaseous or liquid "unit" to a solid state capable of being moulded or otherwise shaped into any desired form. The chemical industry, blood brother to our own, has put on the market mainly during the past 35 years some 20-30 different types of plastic materials for the moulding and fabricating industries. And each different from the other.

The versatility of these compounds is due to their having certain important chemical and physical characteristics. All are light in weight, all are dielectrics, all are corrosion or solvent resisting to a greater or lesser degree, some are strong mechanically, a few are quite unbreakable, some are perfectly transparent, and all can be moulded—some to very close tolerances. Altogether these are a set of characteristics possessed by no other material of construction. This versatility has a direct bearing on the markets plastics can enter.

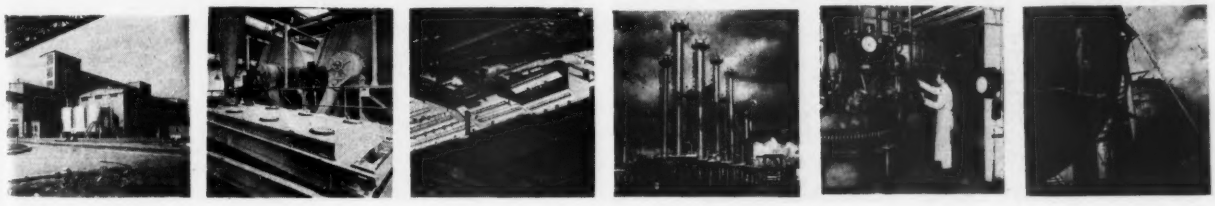
Before 1945 the bulk of the British plastics industry was based on imported cotton and on the coal-tar industry. With our vast resources in coal this was sound policy, at least up to the year 1930, but it seriously limited the type of plastics that could be made in this country, and also its rigidity limited the quality and price of others because certain important chemicals can only be made economically from petroleum. This dangerous situation had long been pointed out in several technical journals but it was not until 1945 that a number of petroleum companies, hitherto operating refineries to produce fuel and lubricants only, decided to erect "chemicals from petroleum" factories.

The happy result of these decisions is that we shall soon be virtually independent of outside resources, so long as we are able to import crude oil. All the new petroleum refineries should be completed within five years. This represents a change of policy comparable with any major industrial revolution of the past, as reports from the petroleum companies infer that a large part of the new production will find its way to the plastics industry.

At this point we may review the growth of production in the plastics industry. Before 1914, when the raw material consisted of cellulose nitrate and some casein, the total annual production was probably little more than 2,000 tons. By 1938, with the growth of the purely synthetic plastics, production was 30,000 tons and was mounting rapidly.

In 1949, when capacity had grown to 185,000 tons, the industry decided to install new machinery, including much automatic and semi-automatic plant, so that the country would be able to attain eventually a capacity of 330,000 tons. Today the capacity is of the order of 250,000 and the additional expansion will be carried out during the next few years. (U.S.A. production during the current year will be about 1,200,000 tons.) It must also be pointed out that since the petroleum companies have by no means got into their full stride, present output has been carried out largely without the aid of the new "indigenous" chemicals.

The predominant expansion took place in the fields of phenolic and urea-formaldehyde resins, in polythene, in polyvinyl chloride and copolymers, and in polystyrene. Preparations were also made for the production of home-produced melamine resins which opens up the possibility



The new raw material factories approach completion.

of expansion in table-ware, many other consumer goods, improved laminated surfaces for furniture, etc.

Following normal procedure, this period of intense new building should be followed only by a period of marking time and by solid work on market research. However, it is by no means certain that this will be the case, for 1950, 1951 and 1952 were years in which yet another group of synthetic resins of exceptionally high mechanical properties came to the centre of the plastics stage. The new resins are called the polyester group and are most generally employed, in conjunction with glass fibre or fabric made from glass filaments, to produce structures of exceptional strength. Prototypes of motorcars and boats have been made (the Admiralty having several such small boats under rigid tests), while fishing-rods and translucent corrugated roofing are already in production. Aircraft structures, including radomes, are already common. This new section of the plastics industry is only in its infancy, and yet four companies announced publicly late in 1952 that they were to begin production of the new resins. This, clearly, was not envisaged in 1949. Concurrently, and partly as a result of work at the Royal Aircraft Establishment, production of similar constructional units has been developed using asbestos and special phenolic resins. Prototype aircraft wings have been produced and paraboloidal scanners 14 ft. in diameter are now manufactured by an aircraft manufacturing company.

Yet another example of an important development that will affect production henceforth is the sudden disclosure of a new process of metal casting in which very thin shells of sand bonded with a synthetic resin can be successfully employed as moulds, instead of the large masses of sand normally employed untreated with resins. Although some aspects of the process were known in 1946, full details of the patent situation were far from clear, and the metal industry was loth to make any advance until further clarification had been made.

The process is now being used in a few factories and it is presumed that it will spread to others, since it promises great economies. It is estimated that this single application will consume a minimum of 7,000 tons of phenolic resins in this country alone, a figure approaching the total production of this type of resin before 1938.

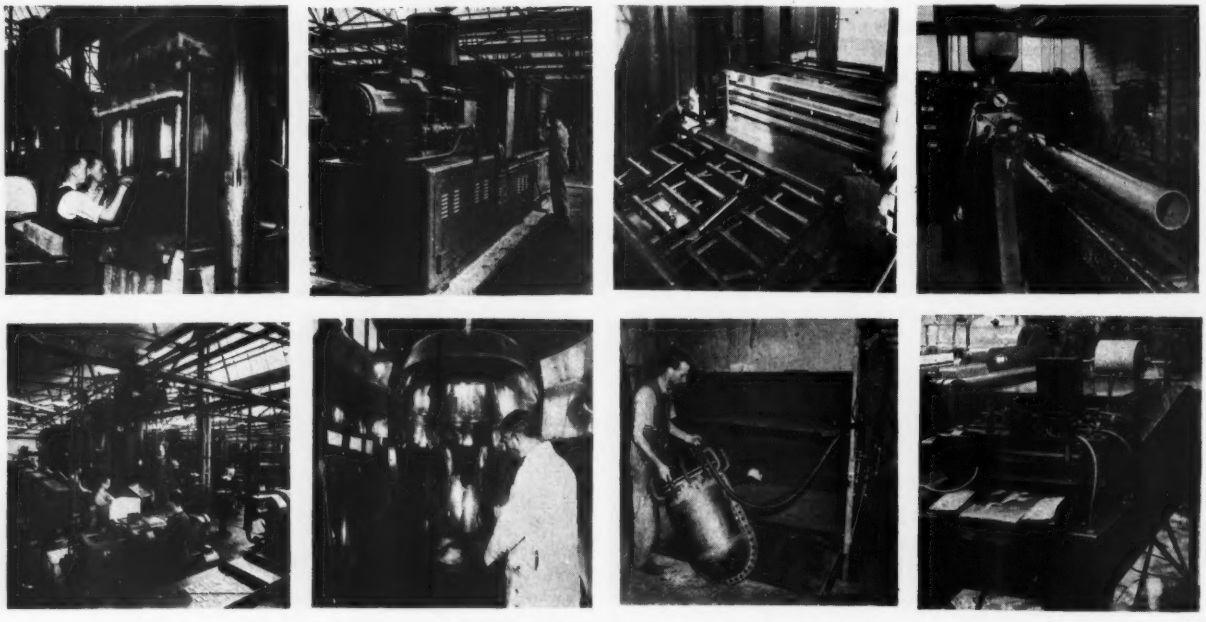
Finally we must mention the latest development in large-scale manufacture of the epoxy resins by two companies. The use of this type is especially significant for the electrical industry, for small units can be embedded completely therein and thus protected from outside adverse conditions. They can also be used to build up streamlined surfaces on irregularly shaped structures and to make high-grade lacquers.

Attention is drawn to these examples merely to show how difficult it is to foretell, except in very general terms, what will happen during the next ten years.

The extraordinary growth in the variety of raw materials used in the industry, and in the productive capacity of the factories, is well balanced by expansion in the moulding and fabricating factories where the plastic materials are converted into finished moulded units. Although space limitations in some congested industrial areas often prevent the best of layouts, at no time in its history has the moulding section of the industry been so well provided with machines of the latest design and highest efficiency. This is true of all its divisions of compression, injection, extrusion and fabrication from sheet.

Progress in this field is especially exemplified in the manner in which moulders have faced up to the inevitable increase in size of injection machines, such increase indicating a constant growth in the size of finished mouldings, and therefore an extension of the fields into which the plastics industry can penetrate. Before the war the largest injection machine in the country was probably a two-ounce machine—that is, a machine capable of producing a moulding weighing two ounces (or a number of smaller mouldings with a total weight of two ounces) in a cycle of 30 seconds. By 1946 several hundred such were in use and the capacities of machines had increased rapidly to 4 oz., 6 oz., 8 oz., and 16 oz. Today there are many of the latter, several 40 oz. machines and one or two with 60 oz. capacity and over.

Obviously this increase in weight of capacity of injection machines means that we can produce units of larger area. Whereas 10 years ago we could produce, on such high-speed machines, only jobs of a maximum of about 6-9 square inches, the larger machines are already producing refrigerator receptacles of more than 144 square inches and we are in sight



The modern moulding and fabrication factories of the Plastics industry.

of production of one-piece refrigerator doors each 7-8 lb. in weight and with a total area of 1,200 square inches. Fifteen years ago refrigerators contained no plastic whatsoever, other than that essential for electrical components. Today there is no refrigerator that does not contain plastic trays, ice-block separators, door sections, control instruments and so on. They are hygienic and non-rusting, they retain their strength at low temperatures and are highly efficient heat insulators.

The history of the plastics industry as a substantial and identifiable part of the economy may be said to have begun in the early 20th century with the growing demands of the electrical industry, which is still its biggest customer. Today the rubbers, bitumens, shellacs, ebonites, fabrics, porcelains, glasses and other early insulators, have been largely replaced by synthetic resins, except where their specific properties, such as very high temperature resistance, are superior or show greater economy. On the whole, however, the replacement by plastics materials has taken place because of superior technical efficiency, e.g. high dielectric and mechanical strength, mouldability, resistance to weather conditions. Today the plastics industry supplies a bewildering number of units, varying from tiny condensers and winding coils to transformer cylinders 9 ft. in diameter by 12 ft. long.

This type of progress, the use of plastics because of technical worth, has largely been the case with many other fields of application: the following examples may give a pointer to the immediate future of the industry.

One of the most modern of plastic materials, polythene, first discovered in this country and produced about 1937, was largely responsible, because of its outstanding electrical properties, for our superiority in radar technique in 1940. But it also possesses other important properties. It is superbly resistant to acids and is for all normal practical purposes, unbreakable. It is therefore extremely important in chemical manufacture. To give a simple example: the only method of transporting say, 10 gallons of hydrofluoric acid was formerly by using a lead bottle. The weight of such a 10-gallon bottle was 84 lb., the liquid weighing, say, about 120 lb. A 10-gallon polythene bottle weighs 7 lb., so that transport is safer and costs diminished. Again, the same material is being extruded in pipe form to convey acid in chemical factories and to convey beer from cellar to bar-pumps. And a much wider field is now under active examination—1 in. piping for conveying water in houses and on farms and small holdings and 12 in. piping for the drainage of trade effluents.

Two of the most important advances in the field of plastic sheeting that cannot but promote widening use in other fields have been hastened by the recent approval of the Coal Board and the Admiralty respectively of the material known as polyvinyl chloride (p.v.c.). This sheeting is already widely known to the public in the form of water-proof clothing, curtains, table-covers, etc.

The first case refers to the 1952 report of the Special Committee formed to inquire into the causes of the Cresswell Colliery disaster in 1951. The report states that the underground fire arose through excessive friction and ignition of the rubber belt coal-conveyors. Henceforth all such conveyor belts are to be replaced by p.v.c. belts, which are not only non-inflammable but highly abrasion resisting. Tens of thousands of miles of such belting will be installed during the next few years and doubtless this replacement will be made in underground mines throughout the world.

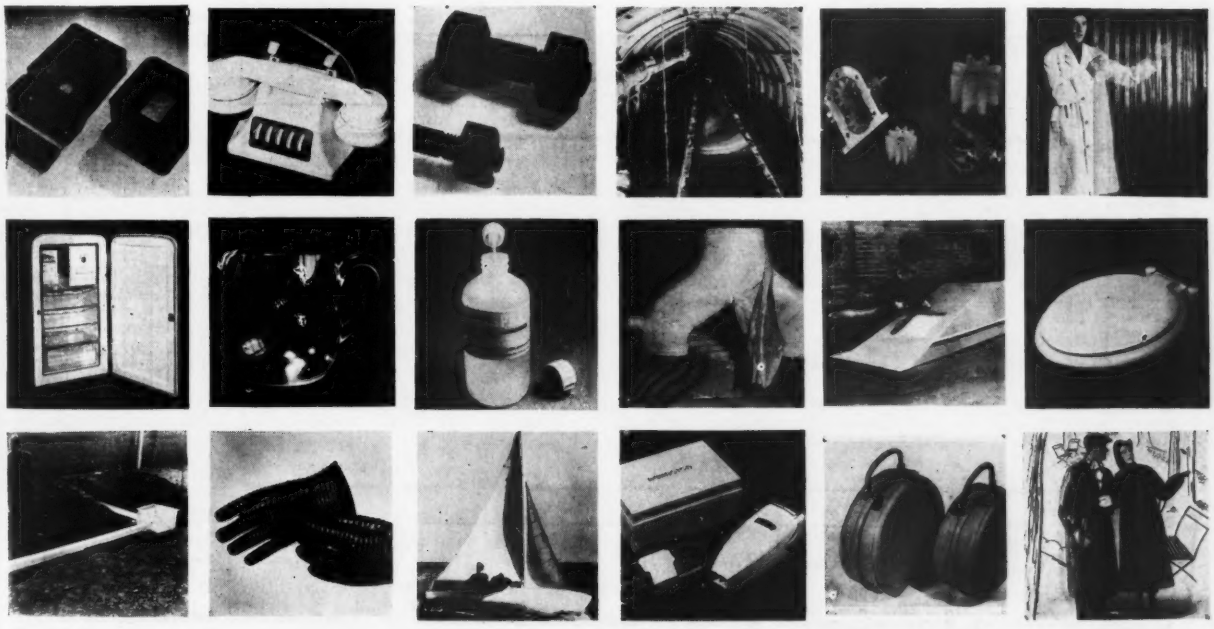
The second case refers to the prolonged testing by the Admiralty under severe Service conditions of the use of p.v.c. for rough-weather clothing. This clothing has now passed all the stringent tests and replaces the traditional " oil-skin."

At this point note should be made of the fine work done by the Committees of the British Plastics Federation and the British Standards Institute in compiling high standards of products without which no industry can really progress. The two latest standards dealing with p.v.c. sheeting and with extruded plastic tubing (for domestic water supply, farms, civil engineering, chemical factories and the food industries) have recently been published.

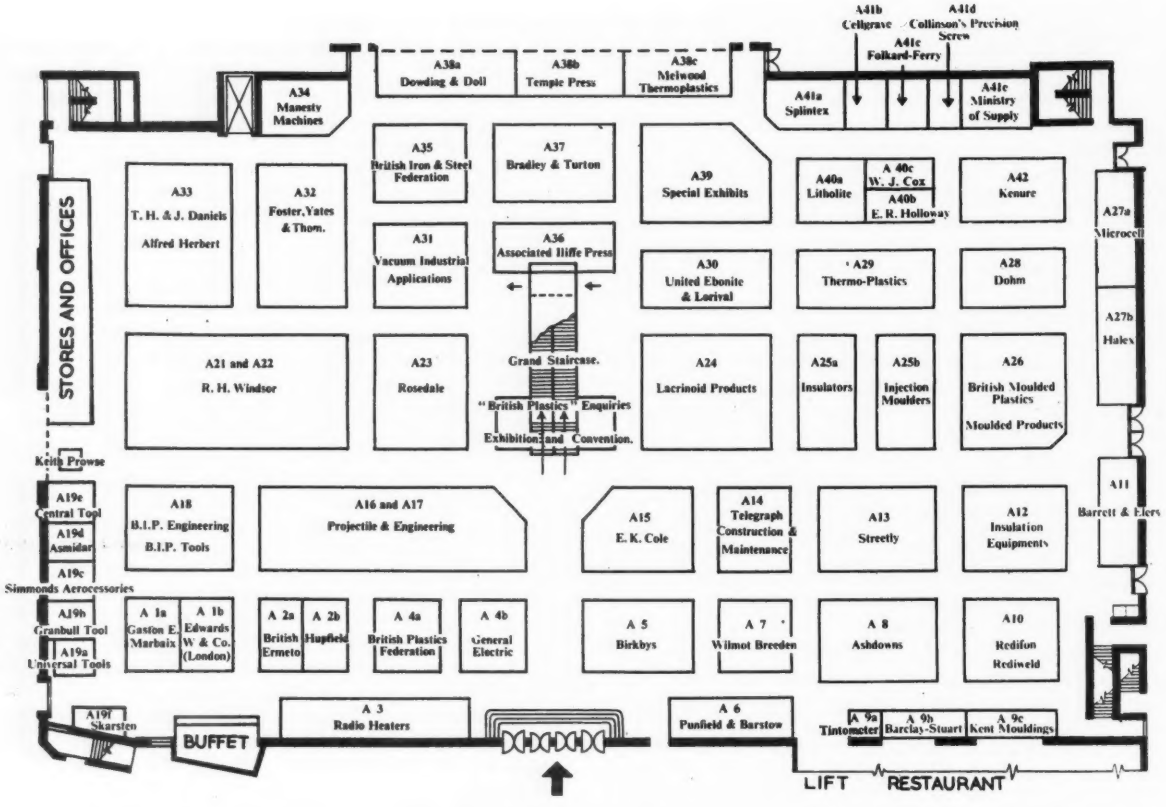
There is little doubt of the path the plastics industry is making for itself. We ourselves cannot see all the country beyond, but what we can see is good and full of promise.

The question has often been asked: " How far can plastics replace metals? " This problem arises most generally when metals are in exceptionally short supply, a situation that occurred in 1950 and 1951 owing to stockpiling of zinc and

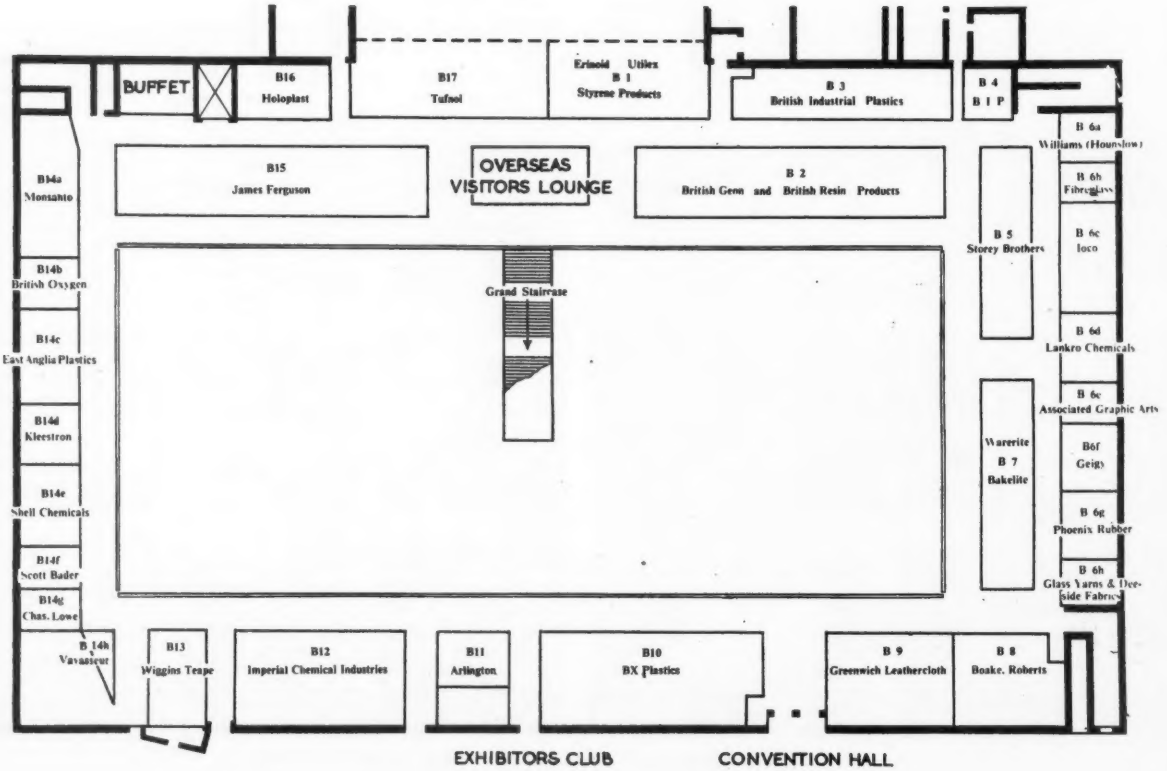
(*Continued on page 217*)

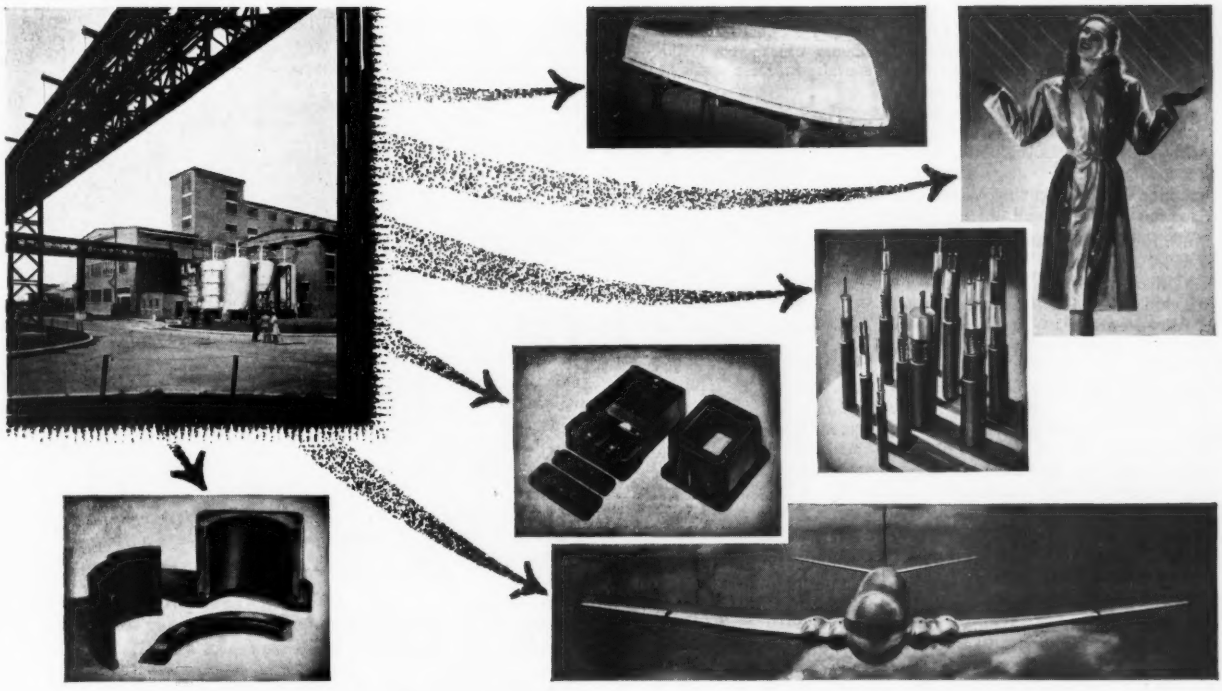


A small cross-section of the finished products of the modern plastics industry.



(Above) Ground Floor **EXHIBITION FLOOR PLANS** (Below) First Floor





THE BRITISH PLASTICS EXHIBITION AND CONVENTION, 1953

A Special Supplement to "Plastics"

FOR the second time the British plastics industry presents itself in a show of its own—to the technical experts, to the visitors from overseas and to the public. Here in the National Hall, Olympia, from June 8-18, we shall see the latest developments and techniques and raw materials. A fascinating display, worthy of an industry which has made such rapid progress since the days of its development before the last war.

Apart from the direct value to the industry of such an exhibition, the long-term benefit is not difficult to discern. A public which today is emerging from its early thoughts of plastics only in terms of fancy goods cannot fail to be impressed by the technical improvements in applying resinous products to every branch of industry. Again, in the sphere in which the public is accustomed to seeing plastics, in the home, in toys, in artificial jewellery and in countless other ways, the steady improvement in design and wiser choice of materials reaches its full impact on the public mind on an occasion such as this.

In planning this supplement to *Plastics*, the emphasis has been focused, not unnaturally, upon trade and technical developments. Exhibitors fall generally into three groups, moulders and fabricators, raw-material suppliers, and machinery manufacturers; this pattern has been observed in the pages which follow. For the general lay-out and location of the stands reference should be made to the floor plans on page 182.

The reader will find that in each group companies are reviewed alphabetically. Stand by stand is given the company's name, address, stand number, and a general description of the company's products. Following this information is a review of the stand, special attention being given to exhibits which are to be seen for the first time this year.

At an exhibition such as this it is very desirable that the visitor be able to make contact with the people he wants to meet quickly and without difficulty. To this end the information in the company reviews has been supplemented by tables. Much thought has been given to their preparation and it is hoped that they will materially assist not only the visitor to the exhibition but the reader, wherever he may be, whether he is interested in plant, materials, or mouldings.

The contents list which follows is intended as a general guide to the exhibition supplement. Within the supplement itself the reader will find helpful information as to the structure and scope of Britain's plastics industry. Visitors to the Exhibition and all connected with the industry are cordially invited to meet the staff of *Plastics* at Stand No. A38b.

GUIDE TO SUPPLEMENT

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N

EXHIBITORS.

The following symbols are used to indicate in which section of this supplement exhibitors are to be found:— M: Machinery, F: Fabricators, R: Raw Materials, P: Press and official.

	Stand Number	Section
Arlington Plastics Development Ltd.	B11	R
Ashdowns, Ltd.	A8	F
Asmidar Plastic Moulding Machines, Ltd.	A19d	M
Associated Iliffe Press, Ltd.	A36	P
B.I.P. Engineering, Ltd.	A18	M
B.I.P. Tools, Ltd	A18	M
B.X. Plastics, Ltd.	B10	R
Bakelite, Ltd.	B7	R
Barclay-Stuart (Plastics), Ltd.	A9b	F
Barrett & Elers, Ltd.	A11	F
Birkbys, Ltd.	A5	R & F
Boake, A., Roberts & Co., Ltd.	B8	R
Bradley & Turton, Ltd.	A37	M
British Ermeto Corporation, Ltd.	A2a	M
British Geon, Ltd.	B2	R
British Industrial Plastics, Ltd.	B3 & B4	R
British Iron and Steel Federation	A35	P
British Moulded Plastics, Ltd.	A26	F
British Oxygen Co., Ltd.	B14b	R
British Plastics Centre Ground Floor and	A36	P
British Plastics Federation	A4a	P
British Resin Products, Ltd.	B2	R
Cellgrave Co., Ltd.	A41b	F
Central Tool & Equipment Co., Ltd.	A19e	M
Cole, E. K., Ltd.	A15	F
Collinson's Precision Screw Co., Ltd.	A41d	M
Cox, William J., Ltd.	A40c	F
Daniels, T. H. & J., Ltd.	A33	M
Dohm, Ltd.	A28	R
Dowding & Doll, Ltd.	A38a	M
East Anglia Plastics, Ltd.	B14c	R
Edwards, W. & Co. (London), Ltd.	A1b	M
Erinoid, Ltd.	B1	R & F
Ferguson, James, & Sons, Ltd.	B15	R
Fibreglass, Ltd.	B6b	R
Folkard-Ferry, Ltd.	A41c	F
Foster, Yates & Thom, Ltd.	A32	M
Geigy Co., Ltd,	B6f	R
General Electric Co., Ltd.	A4b	M & F
Glass Yarns & Deeside Fabrics, Ltd.	B6h	R
Granbull Tool Co., Ltd.	A19b	M
Greenwich Leathercloth Co., Ltd.	B9	F
Halex, Ltd.	A27b	F
Herbert, Alfred, Ltd.	A33	M
Holloway, E. R., Ltd.	A40b	F
Holoplast, Ltd.	B16	R
Hupfield Brothers, Ltd.	A2b	M
Imperial Chemical Industries, Ltd.	B12	R
Injection Moulders, Ltd.	A25b	F
Insulation Equipments, Ltd.	A12	F
Insulators, Ltd.	A25a	F
Ioco, Ltd.	B6c	F
Kent Mouldings	A9c	F
Kenure, J. F., Ltd.	A42	F
Kleestron, Ltd.	B14d	R
Lacrinoid Products, Ltd.	A24	F
Lankro Chemicals, Ltd.	B6d	R
Litholite Insulators & St. Albans Mouldings, Ltd.	A40a	F
Lowe, Chas. & Co. (Manchester), Ltd.	B14g	R
Manesty Machines, Ltd.	A34	M
Marbaix, Gaston E., Ltd.	A1a	M
Melwood Thermoplastics, Ltd.	A38c	F
Microcell, Ltd.	A27a	F
Ministry of Supply	A41e	P
Monsanto Chemicals, Ltd.	B14a	R
Moulded Products, Ltd.	A26	F
Phoenix Rubber Co., Ltd.	B6g	F
Plastics	A38b	P
Projectile & Engineering Co., Ltd.	A16 & 17	M
Punfield & Barstow (Mouldings), Ltd.	A6	F
Radio Heaters, Ltd.	A3	M
Redifon, Ltd.	A10	M
Rediweld, Ltd.	A10	M & F
Rosedale Associated Manufacturers, Ltd.	A23	F
Scott Bader & Co., Ltd.	B14f	R
Shell Chemicals, Ltd.	B14e	R
Simmonds Aerocessories, Ltd.	A19c	M
Skarsten Manufacturing Co., Ltd.	A19f	M
Splintex, Ltd.	A41a	F
Storey Brothers & Co., Ltd.	B5	F
Streetly Manufacturing Co., Ltd.	A13	F
Styrene Products, Ltd.	B1	R
Telegraph Construction & Maintenance Co., Ltd.	A14	F
Temple Press Ltd.	A38b	P
Thermo-Plastics, Ltd.	A29	F
Tintometer, Ltd.	A9a	M
Tufnol, Ltd.	B17	R
United Ebonite & Lorival, Ltd.	A30	F
Universal Tools, Ltd.	A19a	M
Utilex, Ltd.	B1	R
Vacuum Industrial Applications, Ltd.	A31	M
Vavasseur, J. H. & Co., Ltd.	B14h	R
Warerite, Ltd.	B7	R
Wiggins Teape Group, The	B13	R
Williams (Hounslow), Ltd.	B6a	R
Wilmot Breeden, Ltd.	A7	F
Windsor, R. H., Ltd.	A21 & A22	M

PRESS AND OFFICIAL

"British Plastics," Associated Iliffe Press, Ltd. **A36**

Dorset House, Stamford Street, London, E.C.1.

Publishers and proprietors of trade and technical journals and technical books.

PUBLISHERS of the monthly journal, *British Plastics*, and organizers and sponsors of The British Plastics Exhibition and Convention.

Associated Iliffe Press are also publishers of technical books dealing with various aspects of the industry.

The British Iron and Steel Federation **A35**

Steel House, Tothill Street, London, S.W.1.

The national association for the industry.

INFORMATION is available on this stand on all aspects of iron and steel.

The British Plastics Federation **A4a**

47-48 Piccadilly, London, W.1.

The trade association for the British plastics industry

NATIONALLY recognized, the Federation maintains an information bureau and regularly publishes abstracts of the world's literature on plastics. Information on all aspects of the industry and the work of the Federation's many technical committees can be obtained on this stand.

The Ministry of Supply **A41e**

Shell Mex House, London, W.C.2.

Research projects in plastics.

EXAMPLES are shown of work carried out at the various research stations of the Ministry.

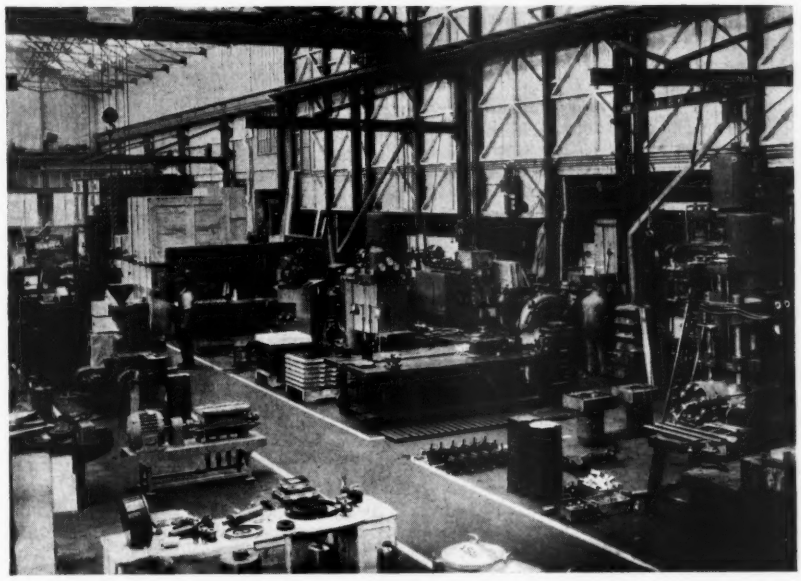
"Plastics," Temple Press Ltd. **A38b**

Bowling Green Lane, London, E.C.1.

Proprietors of technical journals, including "Plastics," a monthly periodical devoted to the manufacture, uses and potentialities of plastics raw materials. Publishers of technical books.

PUBLISHERS of the following important text books dealing with the plastics industry: "Moulds for Plastics," "Cellulose Acetate Plastics," "Plastics, Scientific and Technological" and "The Theory of Polymerization."

The staff of *Plastics* will be pleased to meet visitors and exhibitors. On the stand are shown many interesting examples illustrating the vast diversity of the industry's products.



General view of works of T. H. and J. Daniels Ltd., Stroud, showing transfer presses under construction.

Machinery Manufacturers

Asmidar Plastic Moulding Machines, Ltd. **A19d**
5 Rampayne Street, London, S.W.1.
Hand-operated bench injection moulding machines.

THE APM hand-operated bench injection moulding machine having a maximum capacity of some ⅝ oz. (19 grams) is intended for both laboratory and industrial work. It may be used with all thermoplastic moulding materials and production rates of up to 100 shots per hour can be obtained with some types of moulds. The electrical heating system of the machine may be connected to any standard lighting voltage supply. The company also supply moulds of standard dimensions, 70 mm. by 70 mm. by 40 mm., for use with this machine.

B.I.P. Engineering, Ltd. **A18**
Aldridge Road, Streetly, Staffordshire.
Hydraulic moulding presses and pelleting machines

FIVE machines are shown by this company, four of which have only been shown once before, at the British Industries Fair last month. The Bipel auto-control low-pressure press is designed to meet the rapidly extending field of polyester-epoxy resins, reinforced with glass, asbestos or other fibres. The main features of the press are the large daylight and platen area, infinitely variable pressure to area ratio from 3 to 150 tons on a 4 ft. square platen, a high mould parting force and a sliding mould table for ease of loading. The Bipel fully-automatic 60-ton press has been built for use where long runs and small mouldings are required. The feeding arrangement is simple and fast, giving a press open time of only 10 sec. Three Bipel hydraulic pelleting machines having 12-ton, 35-ton and 70-ton pressure, produce pellets up to 4½ in. diameter at varying rates. (Descriptions of the machines are given on page 210.)

B.I.P. Tools, Ltd. **A18**
Tyburn Road, Erdington, Birmingham.
Toolmakers for plastics mouldings.

THIS company, a member of the B.I.P. Group, will show its services as toolmakers to moulding industry. Technical staff are available to discuss toolmaking problems.

Bradley and Turton, Ltd. **A37**
Caldwall Works, Kidderminster.
Manufacturers of plastic moulding equipment, hydraulic presses, pumps, accumulators, pelleting presses and hydraulic metal-drawing presses.

ON display for the first time is a 350-ton self-contained hydraulic press fitted with electrically heated platens and automatic time cylinder control unit. Apart from loading and ejecting operations, this press is completely automatic in operation, the moulding cylinder being controlled by a separate floor-mounted unit at the side of the press, operated by push-button control. On top of the press itself is the pump and motor, including a prefiller mounted on the main cylinder.

Also shown is the 924, 75-ton, self-contained hydraulic press fitted with electrically heated platens, the 50-ton, semi-automatic press, the 50-ton hydraulic side-ram press, the 25-ton up-stroking press and the hand-operated 50-ton press.

As an example of the pumps manufactured by this company, visitors to the stand can see the No. 4 automatic pump, which has a low-pressure output of 20 gallons per minute and variable stroke on the high-pressure supply. A larger edition of the No. 1 Hilo pump, this new, automatic pump is powered by an electric motor and is designed for use with a battery of up-stroking presses.

Also on display is the typical automatic-control unit.

British Ermeto Corporation, Ltd. **A2d**
Beacon Works, Hargrave Road, Maidenhead, Berks.
Makers of ancillary equipment for the plastics industry.

THE Ermeto pipe coupling is patented throughout the world and is capable of withstanding the highest industrial pressures even under conditions of extreme vibration. It is widely used on hydraulic presses and any other hydraulically operated machines, and is available in a variety of fittings for steel, stainless steel, aluminium and brass tubes. A full range of couplings is on display, as well as a number of the Ermeto high-pressure valves.

Central Tool and Equipment Co. Ltd. **A19e**
Centec Works, Hemel Hempstead, Herts.
Manufacturers of all kinds of machine tools.

THREE machines are on display. The first is the Centec router which has proved valuable for the cutting and trimming of plastics. The machine runs at 18,000 r.p.m. and, manufactured from aluminium-alloy, weighs only 21 lb. The motor is a 1½-h.p. D.C./A.C. single-phase unit operating at 50 cycles. Most thermoplastics can be cut with ordinary high-speed steel cutters as used for wood, but certain thermosetting grades require special tungsten carbide tipped cutters.

A new bench-type overarm router stand has been designed for use with the Centec router. Table size is 18 in. by 18 in. and the throat 24 in.

Collinsons' Precision Screw Co., Ltd. **A41d**
Forest Road, Walthamstow, London, E.17.
Metal threads, screws, moulding inserts, turned metal parts.

CONSIDERABLE work has been done by this company in collaboration with the plastics moulding industry towards the standardization of moulding inserts, and the variety and capacity of production available is the principal feature of the stand.

T. H. and J. Daniels Ltd. **A33**
Lightpill Iron Works, Stroud, Gloucester.
Manufacturers and merchants for hydraulic presses, plastics moulding plant, high-speed pumps and ancillary equipment.

ONE of the main features of this stand is the 100-ton low-pressure press for glass fabric moulding. This is the first of a range of hydraulic presses to be manufactured by this company for reinforced plastics. It has a maximum load of 100 tons, with provision for reducing this down to a minimum of 10 tons. The tables are 4 ft. by 3 ft., the daylight 7 ft., and the stroke 4 ft. Passages for cooling water are drilled in the tables. All the hydraulic equipment is on the press head, and a ladder is provided at the side of the machine to give access to the valves for adjustment. The press is fully guarded and has a sliding screen at the front which is operated by a pneumatic cylinder controlled by push buttons. The speed of the press is 5 in. per sec., but when necessary this can

be reduced at certain parts of the stroke. Also displayed is the 100-ton enclosed type press, semi-automatic, having 20-in. square electrically heated platens. It is fitted with a Daniels automatic process timer which gives automatic control of one moulding cycle including, where necessary, breathing, and control of the transfer or ejector cylinder. The press is fully enclosed, and the hydraulic pump and control valves, thermostats, timer and other ancillary fittings are contained in a separate panel at the side of the press. The 2B preforming machine is designed to manufacture tablets up to 1½-in. diameter at a speed which can be varied between 60 and 20 tablets per minute. Self-contained and fitted with a 5-h.p. motor, it is capable of handling most grades of phenolic and urea powders and also certain types of melamine.

Dowding and Doll, Ltd. **A38a**

Greycoat Street, London, S.W.1.

Manufacturers of injection moulding machines.

THREE machines are shown, all operating for demonstrative purposes. The new British-built Lester injection moulding machine is a 4-oz. machine with a 5-oz. capacity and is of solid steel box-type frame construction with patented fast, double-toggle locking mechanism. It has an internally heated injection cylinder with a vertical swing-out injection unit and the high locking pressure of 250,000 lb. is concentrated over the total moulding area which allows unobstructed use of the whole of the platen face for die mounting.

A wide field of application in all modern thermoplastic moulding materials including nylon is provided by the Dowding automatic fast-cycling injection moulding machine. It is claimed to have an outstanding performance and to reduce moulding costs considerably with its ability to produce at a high rate from moulds of single or a few impressions. It functions at over 1,200 complete moulding cycles per hour and has a smooth action, free from shock.

The Westminster power-operated injection moulding machine of 15-gram. capacity is a special production to meet the wide demand for a ½-oz. power injection moulding machine. It provides trouble-free production of 15-gram. mouldings and is equipped with a self-contained power unit.

W. Edwards and Co. (London), Ltd. **A1b**

Worsley Bridge Road, London, S.E.26.

Manufacturers of vacuum coating equipment.

FIVE vacuum-coating units are shown, two for the first time. The smallest is type 6E, which has chamber dimensions as follows: diameter 6 ins., height 12 in. The largest 36E, has a horizontal chamber with double doors, diameter being 36 in. and height 36 in.

All these units are completely self-contained, can be operated by semi-skilled labour and ensure coating in one operation without handling difficulties. Examples of plastics materials treated by this technique are on display.

Foster, Yates and Thom, Ltd. **A32**

Blackburn, Lancs.

Heavy precision engineers, manufacturing hydraulic moulding presses and boilers.

THIS company's exhibits range from a full-scale 50-ton fully automatic moulding press to a model of a Lancashire boiler. The 50-ton is new in the sense that it incorporates the latest developments in automatic operation, and is completely self-contained. Powder measurement and feeding of injection are automatically controlled. The press moulds six impressions at one operation, each impression having a maximum capacity of 6 cu. in. of loose powder.

General Electric Co., Ltd. **A4b**

Magnet House, Kingsway, London, W.C.2.

Manufacturers of infra-red and high-frequency heating equipment.

ON display are examples of equipment manufactured by this company which is used by the plastics industry. This includes infra-red equipment for pre-heating moulding powders. Also shown is high-frequency heating equipment now finding general acceptance in many fabricating techniques and processes.

The Granbull Tool Co., Ltd. **A19b**

39 High Street, Kingston-on-Thames, Surrey.

Manufacturers of press tools, jigs, fixtures and moulds.

ON display are a moulding tool, drawing board and draughtsman, and a selection of samples of moulds made by this company. As manufacturers of high-quality moulds for the plastics industry, the stand sets out to show how experience in design and knowledge of materials can contribute to the production of high-grade tools. As an example of this work, a tool is shown of interest to people who wish to manufacture polythene bottles without experiencing the heavy capital outlay normally associated with this type of work. The tool is designed to be used with standard moulding machines with only a small amount of auxiliary equipment.

Alfred Herbert, Ltd. **A33**

Coventry.

Manufacturers of machine and machine tools and equipment.

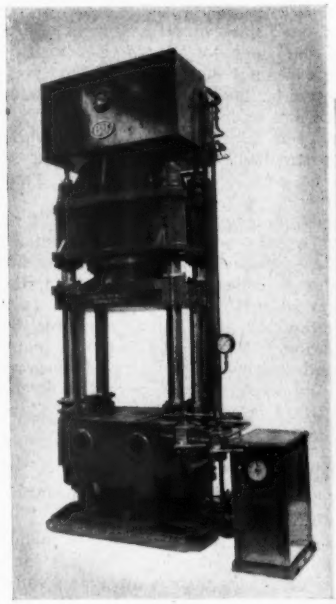
IN association with T. H. and J. Daniels, of Stroud, Gloucestershire, this company is exhibiting a selection of machines from the comprehensive range available for plastics moulding.

Amongst these are the Herbert/Reed-Prentice 10D—8-oz. and 5A—4-oz. injection-

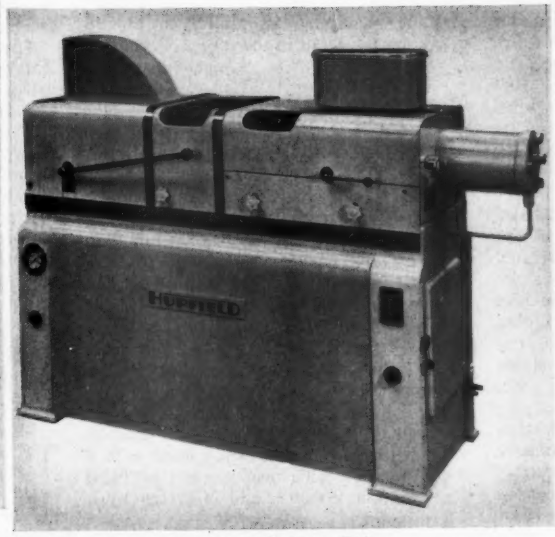
TABLE 1—SHOWING EQUIPMENT MANUFACTURED BY EXHIBITORS.

(Continued on page 188)

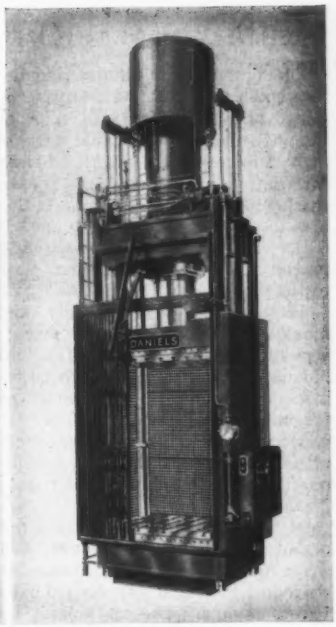
EXHIBITOR	Stand Number	EQUIPMENT MANUFACTURED OR SUPPLIED														
		Compression moulding presses	Low pressure moulding presses	Injection moulding presses	Moulds and dies	Pelleting and pre-forming machines	Moulding accessories	Pre-heating equipment	Hydraulic equipment	Extrusion machines	Welding equipment	Mixing machinery	Granulating machinery	Lathes, routers and other tool-room equipm't	Vacuum coating equipment
Asmidar Plastic Moulding Machines, Ltd.	A19d	..	..	X	..	..	..	..	..	..	..	..	..	..	..
B.I.P. Engineering, Ltd.	A18	X	X	..	..	X	..	..	..	..	..	..	..	..	..
B.I.P. Tools, Ltd.	A18	..	..	..	X	..	..	..	..	..	..	..	..	..	..
Bradley and Turton, Ltd.	A37	X	X	..	..	..	..	..	X	..	..	..	..	..	..
British Ermeto Corporation, Ltd.	A2a	..	..	..	..	..	..	..	X	..	..	..	..	..	..
Central Tool and Equipment Co., Ltd.	A19e	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Collinsons Precision Screw Co., Ltd.	A41d	..	..	..	..	..	X	..	..	..	..	..	..	..	..
T. H. and J. Daniels, Ltd. and Alfred Herbert, Ltd.	A33	X	X	X	..	X	..	..	..	..	..	..	..	..	..
Dowding and Doll, Ltd.	A38a	..	..	X	..	..	..	..	..	..	..	..	..	..	..
W. Edwards and Co., Ltd.	A1b	..	..	..	..	..	..	..	..	..	..	..	..	..	X
Folkard-Ferry, Ltd.	A41c	..	..	X	..	..	..	..	..	..	..	..	..	..	..
Foster Yates and Thom, Ltd.	A32	X	..	..	..	..	..	..	X	..	..	X	..	..	..
General Electric Co., Ltd.	A4b	..	..	..	..	..	..	X	..	..	..	..	..	..	..
Granbull Tool Co., Ltd.	A19b	..	..	..	X	..	..	..	..	..	..	..	..	..	..
Hupfield Brothers, Ltd.	A2b	..	..	X	..	..	..	..	..	..	..	..	X	..	..
Manesty Machines, Ltd.	A34	..	..	..	..	X	..	..	..	..	..	X	X	..	..
Marbaix, Gaston E., Ltd.	A1a	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Projectile and Engineering Co., Ltd.	A16 & A17	..	..	X	X	..	X	..	..	X	..	..	..	..	..
Radio Heaters, Ltd.	A3	..	..	..	..	..	..	X	..	..	X	..	..	..	..
Redifon, Ltd.	A10	..	..	..	..	..	..	X	..	..	X	..	..	..	..
Rediweld, Ltd.	A10	..	..	..	..	..	..	..	..	..	X	..	..	..	..
Rosedale Associated Manufacturers, Ltd.	A23	..	..	..	X	..	..	..	..	..	..	..	..	..	..
Simmonds Aerocessories, Ltd.	A19c	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Skarsten Manufacturing Co., Ltd.	A19f	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Universal Tools, Ltd.	A19a	..	..	..	..	..	X	..	..	..	..	..	..	..	..
Vacuum Industrial Applications, Ltd.	A31	..	..	..	..	..	..	..	..	..	..	..	..	..	X
R. H. Windsor, Ltd.	A21 & A22	..	..	X	X	..	..	..	..	X	..	..	..	..	..
Tintometer, Ltd.	A9a	Apparatus for the measurement and standardization of colour													



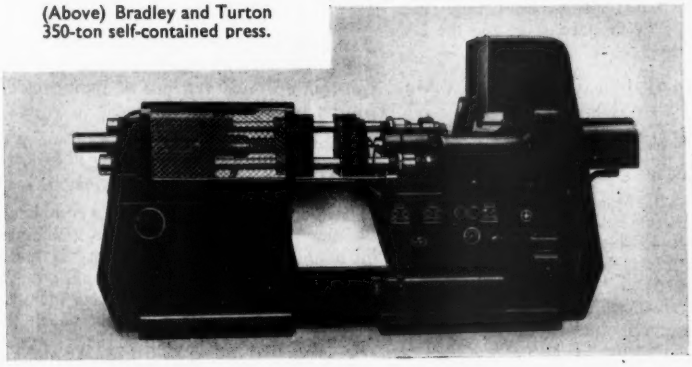
(Above) Bradley and Turton 350-ton self-contained press.



(Above) Hupfield Brothers Ltd., injection moulding machine.



(Above) Daniels low pressure fibre glass press.



(Above) Herbert Reed Prentice injection moulding machine.

(Below) Dowding and Doll, Ltd., fast cycling automatic machine.

MACHINERY AT THE EXHIBITION

(Above) Bipel fully automatic hydraulic press.

MACHINERY MANUFACTURERS—*Continued*

moulding machines. Built under licence in this country, these machines are self-contained and hydraulically operated and can be supplied either for manual, semi- or fully-automatic operation. All thermoplastic materials can be moulded. For the 10D machine die-locking pressure is 250 tons, and the plasticizing capacity per hour is 60 lb. For the 5A machine the die-locking pressure is 90 tons and the plasticizing capacity is 30 lb.

The Edgwick "HY". fully automatic moulding machine is a development of the well-known semi-automatic "HY" machine. Now self-contained, it is equipped for automatic operation and the cylinder provides for rapid, even heating. The moulding capacity is 1½ oz. and the die-locking pressure is 30 tons. Special heater units can be fitted for moulding nylon and p.v.c. materials.

Of importance to mass-production organizations is the Osborn automatic weighing machine, which delivers accurately-weighed amounts at any desired rate up to 16 per minute. The machine is made in four sizes with capacities to weigh from ¼ lb. to 16 lb. Special machines can be built to weigh up to 112 lb.

Another machine—the Tavannes automatic 5-ton moulding press, which is specially designed to mould internal and external threaded plastic parts such as covers and caps for bottles, etc., is on display at the London office of the company during the Exhibition and representatives on the stand can arrange transport.

This machine has 10 independently operated hydraulic cylinders fitted with moulds located vertically round the circumference of the drum, which has an intermittent rotary movement. Each mould can have up to three impressions; fitted with automatic ejector with unscrewing device. Hourly production varies from 225 to 2,700 parts, according to the size and shape of the moulding and plastic material used.

Hupfield Brothers, Ltd. **A2b**
Stanmore, Middlesex.
Makers of press tools, moulds, jigs, fixtures, engraving and special-purpose machines.

THE now well-known 1-oz. and 2-oz. injection-moulding machines are on display and are in working order for demonstration purposes. Advantages claimed include simplicity of operation, the capacity to produce mouldings with a large surface area and the fast cycle which is due to the patent quick-action toggle mechanism for the opening and closing of the die. Accuracy of the temperature control on the plasticizing cylinder is plus or minus one degree. An oil cooler is located in the tank, water-cooling around the ram and provision is also made for water-cooling the mould.

Also on display is the Hupfield granulating machine, completely self-contained, designed for the granulating of all thermoplastic materials. The top is formed as a tray to enable the operator to sort the plastic materials before feeding them into the machine. Powered by a 2 h.p. motor, the machine can be cleaned and completely cleared of material in approximately 10 minutes. Amongst several advantages, may be mentioned its ability to process thermoplastic scrap in the moulding shop.

Manesty Machines, Ltd. **A34**
Speke, Liverpool, 19.
Manufacturers of chemical and pharmaceutical machinery.

THIS company is showing nine machines. The first is the D3A Rotary Tablet machine, fitted with a dust-extraction unit, for the manufacture of pellets up to 1 in. diameter. The output is 320 pellets per minute, and this model can be supplied for a single- or variable-speed drive. The larger machine, the RS2, will produce preforms up to 1⅜-in. diameter at the rate of 325 per minute.

The 3A preforming machine, for single preforms up to 2¼-in. diameter, will produce 32 preforms per minute when fitted with a single punch. This machine can be fitted with multiple punches and is driven by a 3 h.p. motor.

Other machines displayed include the Rotorgran oscillating granulator and the 2A steam still.

Gaston E. Marbaix **A1a**
Vicarage Crescent, London, S.W.11.
Manufacturers, under licence, of equipment originated by the J. M. Nash Company of Milwaukee, Wisconsin, U.S.A.

AUTOMATIC flash lathes were amongst the topics touched upon in the Productivity Report on plastic mouldings issued recently. The Marbaix-Nash 103 machine shown on this stand operates on the continuously revolving turret principle. The ten spindles, however, revolve only during the time they pass the work stations, being stationary in the ejection and loading zone for piece removal and insertion. A choice of production feeds is supplied: 23-45 pieces, 30-60 pieces, or 45-90 pieces per minute. The spindle speed is not dependent upon the production feed, being variable from 1,200 to 3,200 r.p.m.

The spindles of the 103-B machine are driven by a "V"-belt unit at a variable speed of between 700 and 2,000 r.p.m. Alternatively, where it is necessary to have an extremely slow r.p.m. on the spindles a chain and sprocket drive through a small gear reducer is fitted. The work piece diameter capacity of this machine is the same as for the 103. Also common to both lathes is the variability of tools that can be mounted around the working arc of the back table consisting of buffing wheels, abrasive or buffing belts, carbide file flashing units, micrometer adjustable cutters, crimping rollers, grinding wheels, etc.

The Projectile and Engineering Co. Ltd. **A16/17**
Battersea, London, S.W.8.
Machine and Tool Manufacturers.

ON display is the 4/5-oz. machine, an entirely new injection moulding press which is being developed along similar lines to the 16-oz. machine. The 8/10-oz. press is also on display, now fitted with a pre-plasticizing unit of 16/24-oz. capacity. Similar machines include the 2/3-oz. press which can be supplied as a hand-operated machine or a semi-automatic machine.

The 2½-in. Universal extrusion machine can be supplied with a conveyor take-off using a portable combined roller and conveyor.

A mould temperature control unit is shown which pre-heats and maintains accurate mould temperatures. Making use of water as a heat transfer medium, the machine is capable of operating up to a temperature of 220° F. without loss by evaporation. The circulating pump employed is powered by a ½-h.p. electric motor and delivers 7 gal. per min. Dimensions: 2 ft. 1 in. by 2 ft. 1 in. by 4 ft. 2 in.

Radio Heaters Ltd. **A3**
Wokingham, Berks.
Manufacturers of industrial electronic heating equipment.

THIS company specializes in the manufacture of pre-heating machines and sheet welders. On display are examples of the new range of high-speed pre-heating ovens with outputs of 2 kW, 5 kW and 15 kW. Also displayed are new welding presses for thermoplastic sheet with outputs of 2½ kW and 5 kW. Both pneumatically operated and foot-operated versions of these welders will be available.

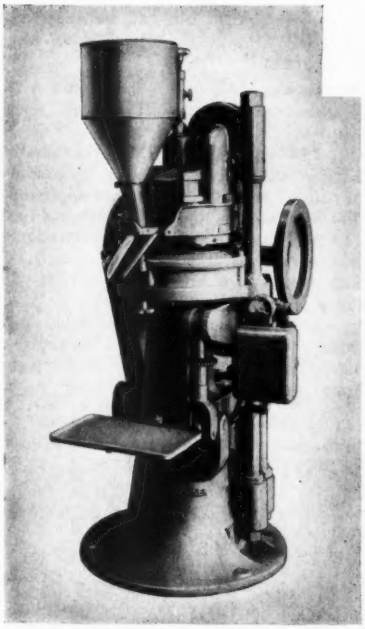
Redifon Ltd. **A10**
Broomhill Road, London, S.W.18.
Manufacturers of welding equipment.

THIS company is introducing a completely new range of plastics welding machines, including the J.P.10, a large press welder capable of dealing with very long, straight welds in a single operation. Also included is the J.P. 9 "Tong" welder, in which the electrodes are portable and connected to the generator by cable, and the J.P.7, a larger version of the popular model J.P.1 giving a considerably increased weld area.

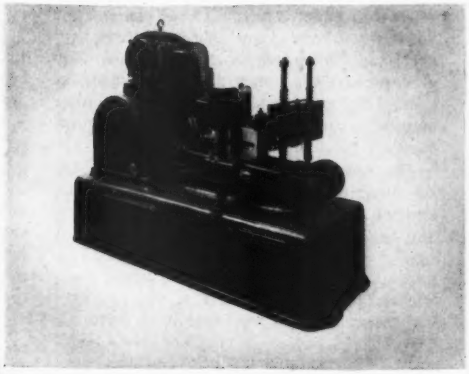
Outstanding is the J.P.10 press welder which sets a new standard of mechanical simplicity and construction in equipment of this type. It is powered by a separate 2 kW R.F. generator, type R.H.36, operating at a high frequency. This combination enables over 8 sq. in. of weld area to be achieved on normal materials and, more important, a single straight-line weld of over 4 ft. in length is possible, and contours 6 ft. or longer can be readily tackled. The press can also be supplied with a sliding table for mass-production work. This machine will enable many problems in the welding field to be solved, particularly in the manufacture of large articles such as inflatable mattresses, beach toys, long seams in plastic upholstery and complete seams in waterproof clothing.

Rediweld, Ltd. **A10**
15-17 Crompton Way, Crawley, Sussex.
Fabricators of rigid p.v.c. and manufacturers of heat sealing equipment.

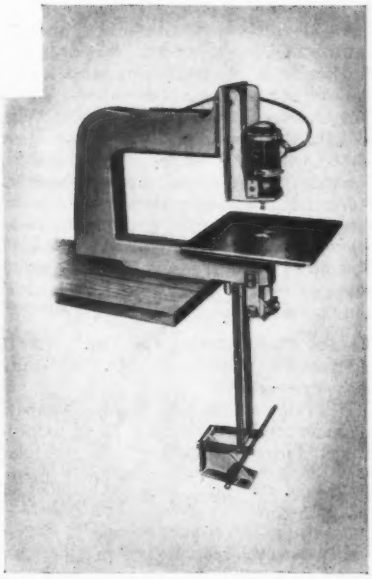
ON this stand are shown many examples of rigid p.v.c. fabricated by welding techniques for various industrial purposes. These include chemical plant and examples are shown of valves, pipes and connections.



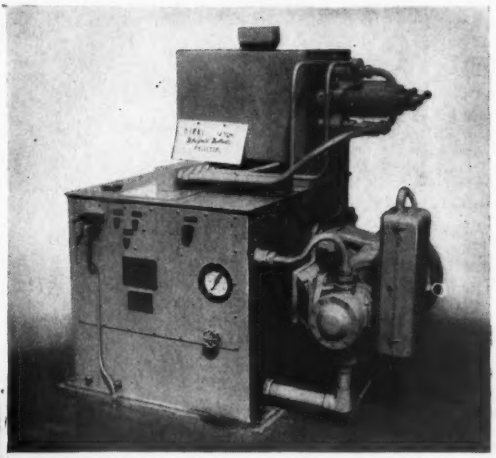
(Above) D3A rotary tabletting machine, Manesty Machines, Ltd.



(Above) No. 4 automatic pump with motor drive, manufactured by Bradley and Turton, Ltd.



(Above) Centec router by the Central Tool and Equipment Co., Ltd.

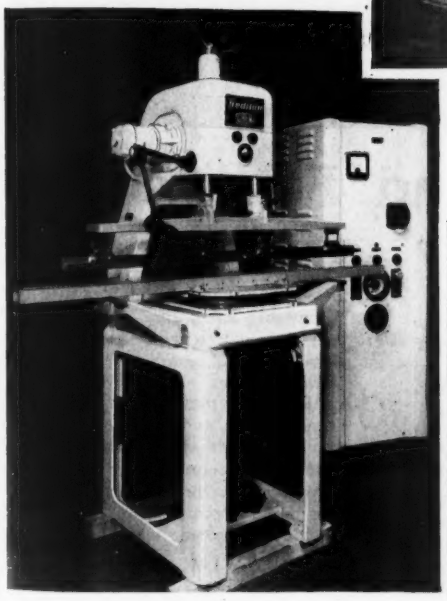


(Left) Bipel horizontal 12-ton hydraulic pelleter.

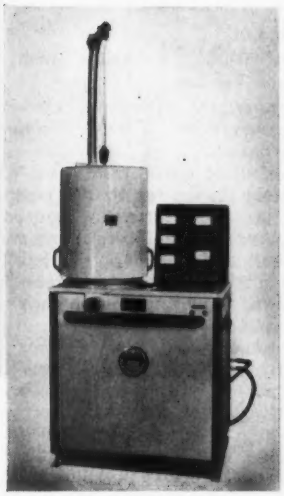
(Below) Redifon, Ltd., JP10 press welder, showing also the generator, type RH36.

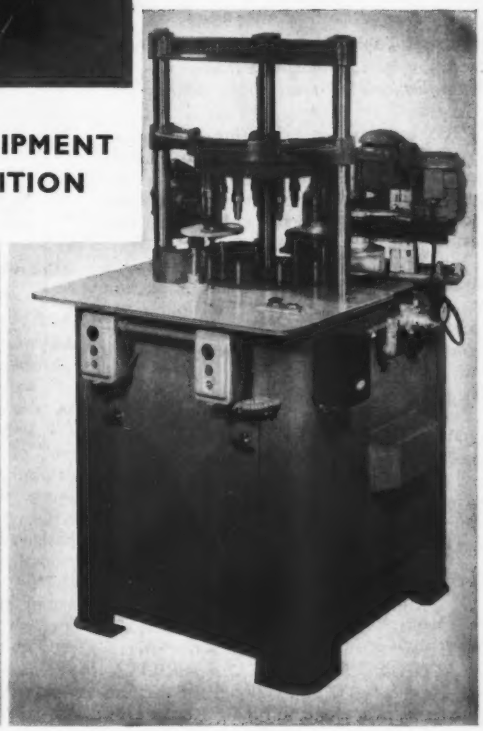
(Below) Marbaix-Nash 103B automatic flash lathe.

ANCILLARY EQUIPMENT AT THE EXHIBITION



(Right) Vacuum coating unit manufactured by W. Edwards and Co. (London), Ltd.





Simmonds Aerocessories Ltd. **A19c**
Treforest, Glamorgan.
Manufacturers of specialized aeronautical and engineering accessories.

THIS company is displaying a large range of Spire speed nuts, fixes and clips. These spring-steel fasteners are made for threaded and unthreaded members and are resilient, self-locking and vibration proof. They simplify the design and production of many moulded articles. A representative selection of components is on show typifying usages in various branches of the plastics industry including toys and radio.

Skarsten Manufacturing Co., Ltd. **A19F**
21 Hyde Way, Welwyn Garden City, Herts.
Makers of scrapers.

THIS firm is exhibiting Skarsten scrapers, hand tools for removing paint, varnish, enamel, lacquer, distemper and dry glue from wood, glass, metal and plaster surfaces, and for dressing down wood to a smooth finish.

The Tintometer Ltd. **A9a**
Salisbury, Wilts.
Manufacturers of the Lovibond Schofield equipment.

THIS company is exhibiting apparatus for the measurement and standardization of colour, notably, the Lovibond Schofield equipment for use with pastes, powders and liquids.

Amongst the interesting applications can be mentioned the use of coloured plastics as the transparency in signal lights. The company will be exhibiting apparatus which can be used to measure the colour and transmittance of these signal filters. The employment of accurate calibration is essential in view of the very exact specifications that are laid down by the authorities using the signal equipment.

Universal Tools Ltd. **A19a**
Tramway Path, Mitcham, Surrey.
Manufacturers of press tools, moulds and jigs.

THIS company is exhibiting a range of articles produced from tools of their design and manufacture, illustrating the quality of the craftsmanship in the tools and indicating the considerable ingenuity in tool design.

Amongst the latter may be mentioned a single-impression mould for the production of a complete record rack for holding 48 records. This tool, which has been constructed for Thames Valley Moulders Ltd. can be seen in operation of The Projectile and Engineering Co Ltd.'s stand and provides a good example of the maximum use of the capabilities of an injection-moulding machine and is interesting in the method of multiple pin-point gating; it will be observed that the product comes from the tool in a finished state—de-gating being automatic.

Vacuum Industrial Applications, Ltd. **A31**
Netherton Road, Wishaw, Lanarkshire.
High vacuum coating plant manufacturers.

VACUUM INDUSTRIAL APPLICATIONS, LTD., specializing in vacuum coating plant manufacture has absorbed the company of British American Research, Ltd., of the same address. This new company is now in a position to offer to industry new high vacuum coating plants of proved effectiveness. These plants, now available, have not been previously exhibited. Intended for industrial use, they give rapid cycle times and ease of operation. They are designed for operation either manually or by automatic control equipment to production requirements.

The twin tank unit, type No. E2H24A, demonstrated, shows alternative automatic control panels—one based on time cycle and the other based on pressure cycle. A single vertical tank unit, type No. EV24, and similar equipment with a single horizontal tank, type No. EH24, are available for inspection. These are fitted normally with manual control but can be supplied, if required, with either of the automatic control panels.

R. H. Windsor, Ltd. **A21 and A22**
Leatherhead Road, South Chessington, Surrey.
Injection moulding and extrusion machines.

THREE extruders and two injection-moulding machines are seen in operation on the Windsor stand. These include the RC 65 and RC 100 twin-screw extruders, incorporating several new features such as splined screw construction for easy removal of the screws, a clutch mechanism to prevent overloading and a water-cooled oil lubricating system. The two injection-moulding machines shown both include new features, the 1 oz. machine being fully automatic.

Moulders and Fabricators

Ashdown, Ltd. **A8**
Eccleston Works, Knowsley Road, St. Helens, Lancashire.
Manufacturers of mouldings, extrusions, laminates and other reinforced materials.

AS a result of considerable work which is being carried out by this company, one of the most interesting groups of exhibits comprises the Fibreglass reinforced sheets, tubes and mouldings. As has been reported in *Plastics*, special techniques have been evolved employing siliconê, melamine, phenolic and polyester resins.

This company is also showing the examples of Ashlam reinforced mouldings for refrigerators and other applications of Ashlam boards for electrical and mechanical applications.

Examples of high-quality mouldings in both thermosetting and thermoplastics materials are shown, as well as extrusions in thermoplastics materials.

Barclay-Stuart (Plastics), Ltd. **9b**
25-27 Brunswick Street, Luton, Bedfordshire.
Proprietary moulders and custom moulders to the electrical, radio, fancy goods and furniture trades.

COMPRESSION mouldings are shown of phenolic, urea and melamine materials and transfer mouldings in phenolics and ureas. In the injection-moulding field, the company employs cellulose acetate and other cellulose plastics, polystyrene, p.v.c., polythene, nylon and acrylic materials.

Barrett and Elers Ltd. **A11**
Dace Road, London, E.3.
Custom moulders in thermosetting materials.

THIS company employs phenolic and urea moulding powders and specializes in work for the electrical and hardware trades

and in the manufacture of closures. On the stand are examples of typical mouldings carried out by this company.

Birkbys, Ltd. **A5**
Liversedge, Yorkshire.
Moulders of thermosetting materials.

ON display are samples of articles moulded by this company. In addition are shown a number of assembled articles which make use of many of the companies products.

British Moulded Plastics Ltd. **A26**
Avenue Works, Walthamstow Avenue, London, E.4.
Custom moulders to the engineering industry specializing in electrical, automobile and chemical engineering work.

THIS company carries out compression, transfer and injection moulding in the majority of thermoplastics and thermosetting materials. Extrusions are also manufactured in polystyrene and p.v.c., and the dipping process is employed also for p.v.c.

On display are a wide range of this company's products and of special interest is a highly intricate injection moulding in nylon. Another new feature is the injection moulding from high-impact polystyrene of refrigerator components.

A duplicate of the box which is being used by the British Everest Expedition for some of their technical test gear, manufactured from glass-fibre reinforced material, is displayed.

Cellgrave Co., Ltd. **A41b**
Crown Works, Godman Road, London, S.E.15.
Fabricators from sheet material.

THIS company carries out custom work in the fields of sheet forming, machining, welding and cementing, marking, printing, embossing and stamping. Materials employed include cellulose plastics, p.v.c., acrylic and other vinyl materials. Examples are shown of the company's products employing these materials and techniques.

E. K. Cole, Ltd. **A15**
Ekco Works, Southend-on-Sea, Essex.
Custom and proprietary moulders and fabricators.

IN the field of compression moulding this company employs phenolic, urea, melamine and polyesters. Transfer moulding is carried out with the three main types of thermosetting plastics and all the most important thermoplastics are injection moulded. The company carries out extrusions using polystyrene, p.v.c. and polythene.

As another aspect of the company's work reference can be made to the wide use of the sheet forming, welding, marking and printing techniques, all of which are applied to the majority of plastics materials. Outlets for the company's products include radio, electrical engineering, refrigeration, general engineering and the fancy goods industries. Examples are shown on this stand of babies' polythene baths, bottles and sink traps. Side by side with these are components designed to withstand the most rigorous electrical tests.

William J. Cox, Ltd. **A40c**
Tower House, Great North Road, London, N.2.
Fabricators of sheet material for industry, research and display.

P.V.C. and acrylic materials are mainly employed by this company in the fields of laminating, sheet forming, machining, welding and printing. Manufacturing custom goods, the company is showing food processing equipment, medical equipment, scientific instruments and machine covers and industrial inspection equipment all employing fabrications carried out by Cox, Ltd.

A novel exhibit is the life-size figure of a

TABLE 2—SHOWING FABRICATED PROCESSES AND MATERIALS EMPLOYED BY EXHIBITORS.

The materials used by each company are shown in this Table by key numbers, as follows:—1: phenolic, 2: urea, 3: melamine, 4: cell. acetate, 5: other cell. materials, 6: polystyrene, 7: p.v.c., 8: acrylic, 9: polythene, 10: nylon, 11: other vinyl materials, 12: polyesters, 13: bitumens, 14: casein, 15: ebonite. Thus the symbol "1-3" indicates that the company concerned uses phenolics, ureas and melamine for the processes indicated.

EXHIBITOR	Stand number	Moulding and fabricating processes employed											
		Compression moulding	Transfer moulding	Injection moulding	Extruding	Laminating	Calendering	Dipping	Sheet forming	Machining	Welding and/or cementing	Marking, printing	Embossing, stamping
Ashdowns, Ltd.	A8	1–3	..	4–10	7	1–3, 12	..	..	..	1–9, 12	..	..	..
B.X. Plastics, Ltd.	B10	..	..	..	4–10, 14	..	7, 11	..	..	..	..	..	..
Barclay Stuart (Plastics), Ltd.	A9b	1–3	1, 2	4–10	..	..	..	..	..	..	..	..	..
Barrett and Elers, Ltd.	A11	1,2	..	..	..	..	..	..	..	..	..	..	..
Birkbys, Ltd.	A5	1–3, 9, 10	1, 3	4–10	..	..	..	..	..	..	..	..	..
British Moulded Plastics, Ltd. and Moulded Products, Ltd.	A26	1–3, 13	1, 2	4–10	6, 7, 9	..	..	7	..	..	..	..	..
Cellgrave Co., Ltd.	A41b	..	..	..	..	..	..	..	4, 5, 7, 8, 11	4, 5, 7, 8, 11	4, 5, 7, 8, 11	4, 5, 7, 8, 11	4, 5, 7, 8, 11
E. K. Cole, Ltd.	A15	1–3, 12	1–3	4–11	6, 7, 9, 11	..	..	..	6–8, 12	..	1–3, 4–6 8–10	1–3, 4–6 8, 10	..
William J. Cox, Ltd.	A40c	..	..	..	..	7, 8	..	..	7, 8	7, 8	7, 8	7, 8	..
Erinoid, Ltd.	B1	..	..	..	4, 7, 14	..	..	..	..	..	..	..	..
Folkard Ferry, Ltd.	A41c	..	..	9	..	..	..	..	..	..	9	9	..
General Electric Co., Ltd.	A46	1–4, 12, 13	1	4–11	..	..	..	..	..	..	..	..	..
Greenwich Leathercloth Co., Ltd.	B9	..	..	..	7	7	7	..	..	..	7	7	7
Halex, Ltd.	A27b	1–3, 12	1–3	4–10	4–6, 9	..	..	..	4–8, 11, 12	..	4, 5, 7, 8, 11	..	..
E. R. Holloway, Ltd.	A40b	..	..	4, 6, 10	7	..	..	..	..	..	7	7	7
Injection Moulders, Ltd.	A25b	..	..	4–10	..	..	..	..	..	..	..	..	..
Insulation Equipments, Ltd.	A12	..	..	..	..	..	..	..	1, 7	1–3, 7	..	..	..
Insulators, Ltd.	A25a	1–3	1, 2	4–10	..	..	..	..	..	..	..	..	..
Ioco, Ltd.	B6c	..	..	..	..	1	..	..	..	..	7	7	7
Kent Mouldings	A9c	1–3	1	4–10	..	..	..	..	..	..	..	..	..
J. F. Kenure, Ltd	A42	..	..	4–11	..	..	..	7	4, 5, 7–9, 11	4–6, 8–10	4–8, 11	..	4–6, 8
Lacrinoid Products, Ltd.	A24	1–3	1–3	4, 6–9, 11	7, 9	..	..	..	6–8	1, 8	..	..	..
Litholite Insulators and St. Albans Mouldings, Ltd.	A40a	1–3, 13	1, 2	..	..	..	..	..	..	..	..	..	..
Melwood Thermoplastics, Ltd.	A38c	..	..	..	4, 5, 7	..	..	..	..	..	..	..	..
Microcell, Ltd.	A27a	1, 7, 11, 12	1	..	7	1–3, 6, 7, 9, 12	..	..	11	..	..	..	..
Phoenix Rubber Co., Ltd.	B6g	..	..	..	7, 9	..	7	..	7	..	..	..	7
Punfield and Barstow (Mouldings), Ltd.	A6	..	..	4–11	..	..	..	..	..	..	..	..	..
Radio Heaters, Ltd.	A3	..	..	..	..	..	..	..	..	..	7	..	..
Rediweld, Ltd.	A10	..	..	..	..	..	..	..	7	..	7	..	..
Rosedale Associated Manufacturers, Ltd.	A23	..	..	4, 6, 7, 9	..	..	..	..	..	..	..	..	..
Splintex, Ltd.	A41a	..	..	..	..	..	..	..	4, 7, 8	4, 7, 8	..	4, 7, 8	..
Streetly Manufacturing Co., Ltd.	A13	1–3	1–3	4–10	..	..	..	..	..	..	..	..	..
Telegraph Construction and Maintenance Co., Ltd.	A14	..	..	9	9	9	..	9	9	..	..	..	..
Thermo-Plastics, Ltd.	A29	1–3, 12	1, 2	4–10	..	12	..	..	4, 6–9, 11	1, 6–9	..	1, 2, 6–8	1, 2, 6–8
United Ebonite and Lorival, Ltd.	A30	1–3, 15	..	4–10	7	7	..	..	..	15	..	..	..
Wilmot Breeden, Ltd.	A7	1, 2, 4, 7, 9	..	6–11	..	..	..	..	..	1, 2, 4, 6–10	1, 4, 6–9	1, 2, 4, 6–9, 11	1, 2, 4, 6–9, 11

man in acrylic designed to show in detail the high fidelity possible with complex shaping. This is the first time the company has exhibited its products although it has pioneered the field of forming, being the first to produce an acrylic nose for the now famous Mosquito bomber.

Folkard-Ferry, Ltd. **A41c**
Archetype Works, Rectory Lane, Edgware, Middlesex.
Manufacturers of plastics mouldings.

SPECIALIZING in the fabrication of polythene this company employs injection moulding, machining, welding and cementing for both custom and proprietary products. The main outlets for these products are in the technical and laboratory equipment fields. On display are siphons, traps of various kinds, measuring cylinders, outlet valves for aspirators and unions.

The General Electric Co., Ltd. **A4b**
Magnet House, Kingsway, London, W.C.2.
Manufacturers, inter alia, of plastics mouldings, infra-red and high-frequency heating equipment.

COMPRESSION, transfer and injection moulding is carried out both for custom and proprietary work in the majority of plastics materials including polyesters and bitumens. Principle outlets lie in electrical engineering, radio, refrigeration, automobile engineering and domestic applications.

Amongst the products on display for the first time on this stand is a range of mouldings for use in the refrigeration industry, polystyrene torch bodies, TV-tube masks and a wringer guard.

The Greenwich Leathercloth Co., Ltd. **B9**
St. Mary Cray, Kent.
Fabricators of p.v.c.

SPECIALIZING in the use of p.v.c., this company employs extruding, laminating, calendering, welding, machining and marking techniques. Custom products find outlets in agriculture, clothing, packaging, furnishing and the general leathercloth trade. Amongst the products on display for the first time are special formulation p.v.c. films. These films are used by the motor trade and allied industries for the production of spare parts. Also shown are drum liners fabricated from p.v.c. film and all types of containers suitable for packaging materials.

Halex, Ltd. **A27b**
Larkshall Road, Highams Park, London, E.4.
Moulders and fabricators for nearly all types of plastics materials.

BOTH custom and proprietary moulders, this company makes use of all thermosetting and thermoplastics moulding materials. The end-products are utilized in refrigeration, electrical and general engineering, armaments and the radio industry. On display for the first time are refrigerator components for the Pressed Steel Co., Ltd., manufactured for the five cu. ft. refrigerator. Also to be seen are new portable radio components moulded in polystyrene and spill pans and drip trays fabricated from Cobex sheet for aircraft and refrigeration work. The company also specializes in sheet forming and welding.

E. R. Holloway, Ltd. **A40b**
Hyde Way, Welwyn Garden City, Herts.
Moulders and fabricators of cellulose acetate, polystyrene, p.v.c. and nylon.

ALTHOUGH largely concerned with the fancy goods industry, for the manufacture of both custom and proprietary goods, this company manufactures p.v.c. containers for chemicals and liquids. To be seen on the stand are nylon combs, extruded p.v.c. tubing and various examples of articles manufactured for the fancy goods industry. One exhibit of this work is the nylon comb pack which contains two dozen combs. It is designed to occupy the minimum of counter space consistent with maximum display.

Injection Moulders, Ltd. **A25b**
Westmoreland Road, London, N.W.9.
Custom and proprietary moulders of industrial components, fancy goods and toys.

SPECIALIZING in injection moulding, utilizing nylon, cellulose acetate, polystyrene, p.v.c., and polythene, the company is displaying for the first time examples of its latest mouldings produced for the radio industry, cosmetic, fancy goods and toy trades. Of particular interest is an injection moulded radio cabinet as well as nylon strain-relief bushings for industrial purposes. A range of new plastic toys is shown.

Ioco, Ltd. **B6c**
Netherton Works, Anniesland, Glasgow, W.3.
Manufacturers of laminated and sheet materials.

EMPLOYING phenolic materials, both custom and proprietary components are manufactured for the electrical and mechanical engineering industries. These include tubes, bearings, gears and rail insulations.

In the thermoplastics field, p.v.c. is used, being fabricated by welding, marking, printing, embossing and stamping. Examples are shown of foul weather garments and of the printing on p.v.c. leathercloth.

Insulation Equipments, Ltd. **A12**
Oswestry, Shropshire.
Fabricators of thermoplastics and thermosetting materials.

SPECIALIZING in sheet forming and machining, this company produces both custom and proprietary articles for the electrical, aircraft, refrigeration and general engineering industries. Amongst the products to be seen for the first time are decorative laminated materials for interior coach panelling and railway coach furniture. Also shown are formed parts of rigid p.v.c.

Insulators, Ltd. **A25a**
Angel Road, London, N.18.
Custom and proprietary moulders of thermoplastics and thermosetting materials.

THE products of this company are widely diverse, ranging from compression and transfer mouldings of thermosetting plastics for industrial components to injection-moulded articles for medical instruments and the fancy goods industry and others. Amongst the products to be shown for the first time at the Exhibition are vaccum jugs, ink-filling stations, nylon gear wheels, polystyrene brush handles and many other examples of technical mouldings.

Kent Mouldings. **A9c**
Footscray, Sidcup, Kent.
Moulders, of both custom and proprietary goods.

COMPRESSION moulders, employing phenolic, urea and melamine materials, and transfer moulders employing phenolic materials, this company produces components for the aircraft, telecommunications, radio, textile and electrical industries. An example of work to be seen in the thermosetting field is a centre shaft golf putter head.

The main thermoplastics are injection moulded and find outlets in toys and games and industrial components.

J. F. Kenure, Ltd. **A42**
Faggs Road, Feltham, Middlesex.
Injection moulders, plastics fabricators and precision mould makers.

THE main thermoplastics are injection moulded and both custom and proprietary products have diverse outlet in fancy goods, toys, advertising, electrical engineering, and many other fields. Of particular interest on the stand are examples of double shot mouldings and mouldings in flexible and rigid p.v.c. Other techniques widely employed include dipping, sheet forming, machining, welding, printing, embossing and stamping.

Lacrinoid Products, Ltd. **A24**
Gidea Park, Essex.
Manufacturers of custom and proprietary mouldings and fabricators of sheet material.

THE majority of thermosetting and thermoplastic materials are used for compression, transfer, and injection moulding. Products of these processes are used for fountain pens, handles of various kinds, buttons, and industrial components. Sheet forming is employed in the manufacture of television screens, television escutcheons and furniture fittings.

Examples of these products are shown on the stand as well as examples of the Vietum technique for the covering of handles, tubes, and rods. Here p.v.c. is used, made to a special formulation, being shrunk on to the product which requires to be covered.

Also shown are blown bottles for various applications and unplasticized p.v.c. tubing.

Litholite Insulators and St. Albans Mouldings, Ltd. **A40a**
Sandown Road, Watford, Herts.
Manufacturers of custom and proprietary thermosetting mouldings.

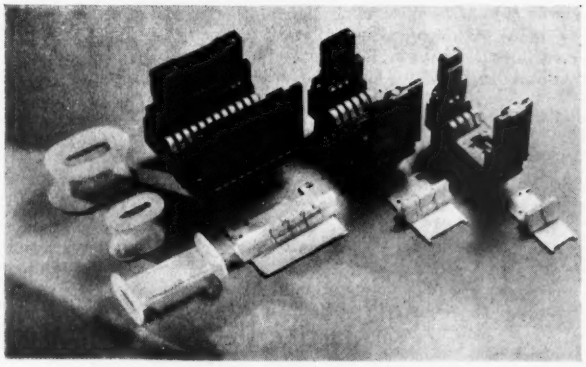
SPECIALIZING in compression and transfer moulding, this company's products are employed by the electrical engineering industry and for general purposes. Materials used include phenolics ureas, melamine and bitumens.

Melwood Thermoplastics, Ltd. **A38c**
Willoughby Road, Harpenden, Herts.
Extruders of thermoplastic sections.

USING cellulose acetate and other cellulose plastics, and p.v.c., this company produces both custom and proprietary extrusions for industrial applications and for the fancy goods trade. On display for the first time are unplasticized p.v.c. tubes in large sizes for chemical plant installations and for

(*Continued on page* 194)

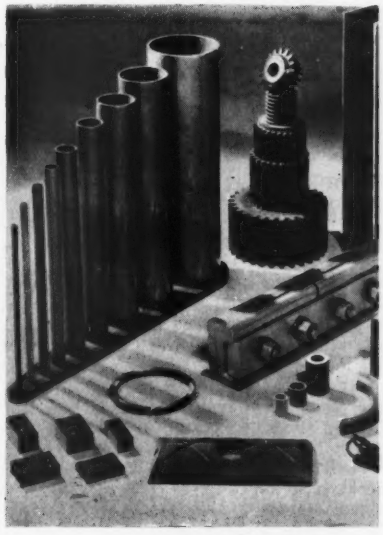
SOME FINISHED PRODUCTS AT THE EXHIBITION



Components for electrical relays, moulded by Birkbys, Ltd., include nylon bobbins and urea and phenolic mouldings.

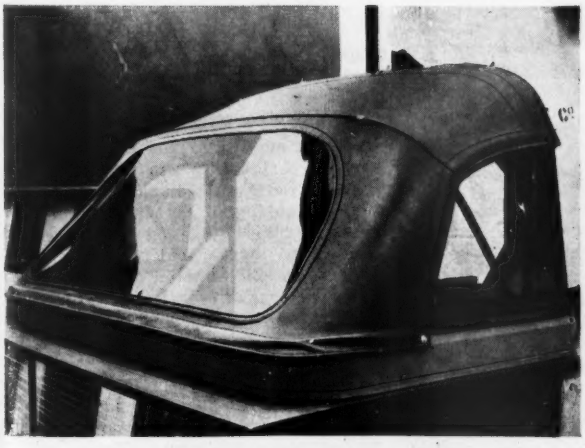
Polystyrene birdcage, moulded in two halves produced from one tool, exhibited by E. K. Cole, Ltd.

Vinyl discs bearing B.B.C. recordings of the Coronation ceremony for overseas use, featured by British Geon, Ltd.



Fabric, paper and wood base laminates produced by loco, Ltd., together with some fabricated components.

Cotton-backed p.v.c. materials for use in shoe manufacture are shown by loco, Ltd.



Flexible rear window and rigid sidescreen for sports cars, made from Vybak transparent vinyl (Bakelite, Ltd.).

Hard top for sports car moulded in glass fibre reinforced polyester laminate, by Microcell, Ltd.

MOULDERS AND FABRICATORS—*Continued*

fume extraction plants. Also shown are large flexible tubes, cellulose acetate butyrate rod up to 1½ in. diameter, and numerous rigid and flexible sections in p.v.c., manufactured mainly to customers' special requirements.

Microcell, Ltd. **A27a**
56 Kingsway, London, W.C.2.
Manufacturers of plastics laminates and mouldings.

EMPLOYED in both custom and proprietary work, this company uses a wide range of techniques and materials for components for the aircraft, electrical, automobile, and general engineering industries. Compression and transfer moulding are carried out as well as the extrusion of p.v.c. and the laminating of a number of thermoplastics and thermosetting materials. Certain of the vinyl plastics are used for sheet forming purposes.

This stand has many interesting exhibits amongst which may be mentioned the selection of Micor glass fibre mouldings, very large moulded honeycomb sections in Micor glass fibre laminate, Micorlite roof lighting material and glass cloth laminates of very high mechanical and electrical properties. Also shown are mouldings in phenolic and urea, decorative panels, and paper laminates.

Moulded Products, Ltd. **A26**
Chester Road, Tyburn, Birmingham, 24.
Custom moulders and extruders.

THIS company shares a stand with its associate British Moulded Plastics, Ltd. They are equipped to do a variety of compression and injection-moulding jobs as well as extrusions in flexible and rigid material. Recent productions for a number of industrial applications are shown.

Phœnix Rubber Co., Ltd. **B6g**
91 Bishopsgate, London, E.C.2.
Fabricators of p.v.c. and polythene, for custom production.

EXTRUDING, calendering, sheet forming, and embossing are techniques employed by this company for the production of sheet materials, flooring compositions, and floor tiles.

Phenco plastic floor covering will be shown in model installations in a variety of attractive patterns and the high resistance to wear and corrosion of this material will be demonstrated.

Phœnix N.S. sheeting to give maximum non-slip properties are displayed. This material is used for flooring, for road surfaces, and for decks and walkways.

Punfield and Barstow (Mouldings), Ltd. **A6**
Westmoreland Road, N.W.9.
Custom moulders for all trades.

THIS company specializes in injection moulding, using all the main thermoplastic materials. To be seen for the first time are hypodermic syringes moulded in nylon, scale blanks in polystyrene, model greenhouses in polystyrene, voltage testers in high acetyl acetate, and nylon cabinet catches.

Rediweld, Ltd. **A10**
15 Crompton Way, Crawley, Sussex.
Fabricators of thermoplastic materials

USING p.v.c. and polythene, this company produces units for use in the chemical and allied industries. Also shown is a new range of unplasticized p.v.c., filter cloths and various types of tank-lining materials.

Rosedale Associated Manufacturers, Ltd. **A23**
11 Upper Grosvenor Street, N.W.1.
Manufacturers of injection mouldings.

CARRYING out proprietary work, this company employs many of the thermoplastic materials in the production of toys, combs, and other domestic and fancy goods.

Splintex, Ltd. **A41a**
Nightingale Road, London, W.7.
Fabricators of thermoplastic materials.

USING sheet material, fabricated in the works, this company carries out machining, marking and printing of cellulose acetate p.v.c. and acrylic materials. Products are used in the aircraft and general engineering industries, in display and advertising, and in radio, safety devices, and various instruments.

Showing for the first time will be screen printed thermoplastic materials, display stands and precision thermoplastic sheet mouldings.

Storeys Brothers and Co., Ltd. **B5**
Whitecross Mills, Lancaster.
Fabricators of p.v.c. materials.

EMPLOYED in custom work, this company calenders p.v.c. and carries out printing, embossing, and stamping. Products include table coverings and are also used for the fabrication of curtains, garments, and fancy goods. On display for the first time are some new types of embossed and printed p.v.c. sheeting.

Streetly Manufacturing Co., Ltd. **A13**
Streetly, Sutton Coldfield, Birmingham.
Trade moulders in thermoplastics and thermosetting materials.

ANOTHER member of the B.I.P. Group, this company has facilities for moulding all types of thermoplastics and thermosetting materials in a factory equipped with machines ranging from 1 oz. injection moulding machines to 1,000-ton compression presses. Examples of recent productions are shown. A new range of melamine ware for catering is also demonstrated.

Telegraph Construction and Maintenance Co., Ltd. **A14**
Greenwich, S.E.10.
Fabricators of polythene.

THIS company uses polythene for injection moulding, extruding, laminating, tapping, and sheet forming. Its products are employed in the electrical industry, in domestic applications, and packaging. The main features of the display are Telcothene powder and Telcothene coated papers.

Telcothene powder can be applied to metal surfaces by the simple hot-dip process which provides a coating having excellent insulating properties and which is proof against corrosion, chemical attack and fungus and mould growth.

Coated papers are employed in many fields, as moisture barriers in Multiwall paper sacks, in the manufacture of drum liners, as wrapping media for food and as facing papers in the manufacture of cap liners. Metal foil laminate coated with Telcothene is marketed as a packaging material for service equipment to be stored under tropical conditions.

Thermoplastics, Ltd. **A29**
Luton Road Works, Dunstable, Beds.
Moulders and fabricators of custom and proprietary articles.

THIS company employs a very wide range of techniques, including compression and transfer moulding, injection moulding, laminating and sheet forming. The majority of thermoplastics and thermosetting materials are used, including polyesters and nylon.

Products are used for display, electrical and general engineering components, aviation and packaging. Marking, printing, embossing and stamping are carried out with both thermoplastic and thermosetting materials.

As an example of sheet-forming technique may be mentioned complicated large structures and in the field of glass-fibre polyester materials may be mentioned radomes, containers, panelling and ducting.

To be seen for the first time is a large radome produced from glass fabric with expanded rubber sandwich filling. Containers and ducting are also shown in glass-fabric materials, as well as displays in aerylic, urea and phenol formaldehyde.

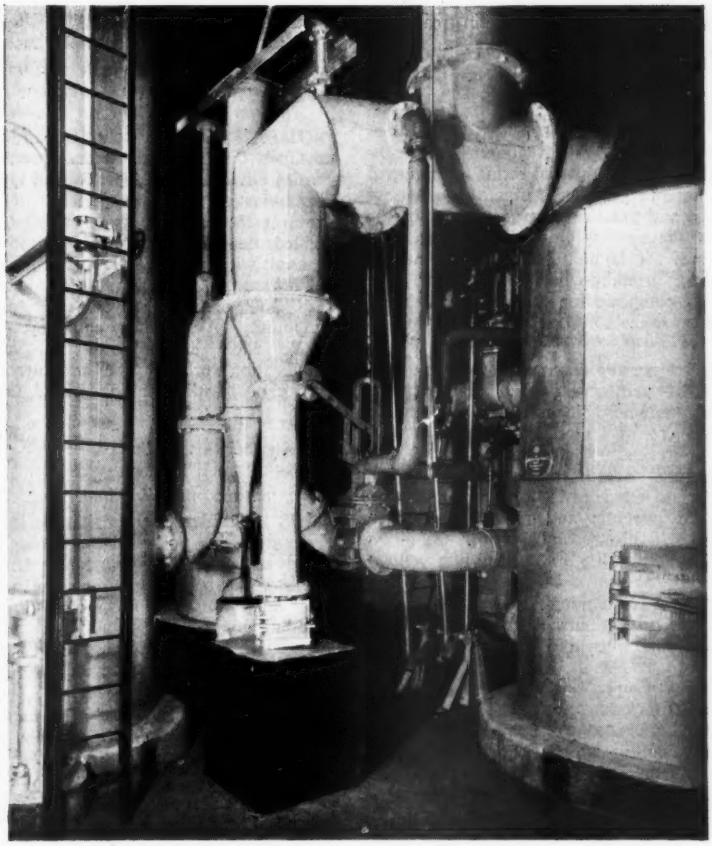
United Ebonite and Lorival, Ltd. **A30**
Little Lever, Nr. Bolton, Lancs.
Fabricators of rubber and plastics materials, custom moulders and extruders.

As its name implies, one of the early activities of the company was the moulding and fabrication of ebonite. The present activities, however, include all branches of the moulding industry, such as bituminous battery case moulding, phenolic and urea compression moulding for the textile, engineering and electrical industries, injection moulded thermoplastic components for batteries and display and general industrial uses and a variety of p.v.c. products.

Wilmot Breeden Ltd. **A7**
Amington Road, Birmingham, 25.
Moulders and fabricators for custom and proprietary work.

BOTH compression- and injection-moulding techniques are used in the production of a wide range of thermoplastic and thermosetting mouldings. Amongst the products may be mentioned steering wheels, domestic appliances and components, badges, escutcheons, etc. Another facet of the work of this company lies in the field of machining, welding, printing and embossing, and here again the principle outlets lie in the fields of vehicle and domestic appliances and components.

Displayed will be examples of these various production techniques including refrigerator-compartment doors, control knobs and escutcheons.



(Left) Part of Barry Plant of British Geon, Ltd.

Materials Manufacturers

Arlington Plastics Development, Ltd. **B11**
Arlinghide Works, Barretts Grove, London, N.16.
P.V.C.-coated leathercloth.

ARLINGHIDE p.v.c.-coated leathercloth, particularly those qualities and designs manufactured for the footwear trade, are shown on this stand. The uses of this material in footwear include uppers, heel and platform covers, strapping and lining materials. A range of upholstery materials is featured, including "Fleurette," a new floral damask-type of design.

BX Plastics, Ltd. **B10**
Higham Station Avenue, Chingford, London, E.4.
Thermoplastics; raw materials, sheets, rods, tubes, etc.

THIS member of the British Xylonite Group is showing one of the largest ranges of thermoplastic materials in different forms produced by any single company. Xylonite, cellulose nitrate, still finds many uses such as knife handles, drawing instruments and cycle accessories because of its good dimensional stability and low water absorption. Cellulose acetate (Bexoid) is produced in the form of moulding powders, sheets, rods, tubes and thin film. Lactoid casein is supplied in forms suitable for the fabrication of buttons, buckles, pens and electrical components. Some of the more recent additions to the range of BX materials are thin p.v.c. packaging film, Cobex vinyl chloride co-polymer sheet, which is finding many new applications in sheet forming work, and a range of polythene lay-flat tubing for packaging purposes. Also of interest are Bexol solutions for a variety of uses such as adhesives and lacquers.

Bakelite, Ltd. **B7**
12-18 Grosvenor Gardens, London, S.W.1.
Moulding materials, laminates and synthetic resins.

IN addition to standard grades of phenolic, urea and p.v.c. moulding materials, three new moulding materials are shown. A rubber modified polystyrene used for greater impact strength, a glass-filled silicone material for better heat resistance and alkyd moulding powders with outstanding electrical properties.

Laminates include paper and asbestos grades and glass fabric based types for industrial use as well as Warerite decorative laminates resins. Both urea formaldehyde and phenolic resins are shown, including lamp capping and wood-working adhesives, together with phenolic resins for shell moulding and the new group of polyesters for laminating and embedding—some recently announced types having special characteristics such as high heat resistance or flexibility.

Exhibits relating to Vybak vinyl compounds show moulded cleaner and refrigerator parts, extruded cable sheathing, toys, floor tiling and ladies' handbags. The use of clear Vybak sheet for the flexible rear window and rigid side-screens of sports cars is also on show.

Birkbys, Ltd. **A5**
Liversedge, Yorkshire.
Manufacturers of moulding materials, resins, cements and varnishes and moulders to the trade.

EXAMPLES are shown of compression mouldings carried out by this company in phenolic, urea, melamine, polythene and nylon materials, transfer moulding in phenolic and melamine and injection moulding in cellulose acetate and other cellulose plastics, polystyrene, p.v.c., polythene, nylon and acrylics.

A number of mouldings are on show for the first time and of particular interest is a series recently produced in the manufacture of electrical relays. These comprise a set of four bobbins in nylon, three armature mouldings in urea and three separate mouldings in phenolic. All these mouldings have to meet extremely exacting requirements, both of size and quality.

Also shown is a full range of transfer mouldings in Diakon, all carried out by the injection moulding technique.

A. Boake, Roberts and Co. (Manufacturing), Ltd. **B8**
Carpenters Road, London, E.15.
Plasticizers, stabilizers, emulsifying agents and mould lubricants.

IN addition to the normal range of phthalate plasticizers, lubricants and stabilizers for vinyl resins, several newly developed materials are shown. Of particular interest to vinyl resin processors are new stabilizers for polyvinyl chloride including lead octyl maleate and glycerol 1.2, isopropylidene ether laurate, which are now available in development quantities. Lead salicylate is a heat and light stabilizer of particular interest to compounders of p.v.c. floor coverings.

The company also manufactures emulsifying agents, drying catalysts and solvents of interest to the plastics industry, and a group of reodorants for masking undesirable smells in plastics compounds.

British Geon, Ltd. **B2**
21 St. James's Square, London, S.W.1.
P.V.C. and co-polymers resins, vinyl latices and compounds, Hycar synthetic rubbers, styrene-butadiene co-polymers and polyacrylic rubbers.

GEON products of particular prominence are Geon 101EP and 103EP which are straight p.v.c. resins, and Geon 202 vinyl/vinilydene chloride co-polymer (low vinilydene proportion) which are particularly suitable for rigid extrusions. Geon 400 x 150 is a new material for pressing microgroove gramophone records.

The theme of the 90-ft. stand shared with British Resin Products, another member of the Distillers Group, is "Geon at Work." Applications of Geon p.v.c. in many fields are shown by the exhibits of end-products utilizing these materials. Particular emphasis is given to conveyor belting for coal mines (a 75-ft. long belt is shown) and for the food industry, to foul-weather clothing and to thin packaging films.

A special feature is made of Geon materials which were used for the B.B.C. recordings of the Coronation commentaries which were flown to all parts of the world on June 2.

British Industrial Plastics Ltd. **B3/4**
1 Argyll Street, London, W.1.

Urea and melamine moulding powders and resins, polyester low-pressure laminating resins.

ONE of the main features of the B.I.P. stand is a range of exhibits demonstrating the versatility of low-pressure moulding with contact resins for bonding glass fibre and indicate the new fields of application for this structural material.

A comprehensive exhibit of melamine ware moulded by various manufacturers from Beetle melamine resin show the result of a series of exhaustive tests carried out with the co-operation of moulders and some well-known stores. This exhibit is of particular interest to the catering trade.

British Oxygen Co., Ltd. **B14b**
Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

Manufacturers of dicyandiamide and melamine.

OF the two chemicals featured, dicyandiamide is of limited interest to the plastics industry where it is mainly used in connection with starch adhesives. Melamine, however, being one raw material for the production of melamine formaldehyde resins is given greater prominence, and products making use of these resins are shown. The main applications are moulded tableware, high-duty electrical mouldings and laminates, surfaces of decorative laminates, boil-proof adhesives and in resin treatments for papers, textiles, leather, etc., as well as for stoving enamels.

British Resin Products, Ltd. **B2**
21 St. James's Square, London, S.W.1.

Resins, moulding materials and adhesives.

IN the field of industrial resins the range of Cellobond polyester resins are of special interest and practical demonstrations of the use of these resins are given. Other types of resins for laminating and impregnating, bonding, grinding-wheel manufacture and rubber compounding are also featured. Foundry resins for shell mouldings are also shown.

Surface coating resins used in the formulation of paints, varnishes, lacquers and stoving enamel, including phenolic oil soluble resins, modified phenolic and cresylic resins, maleic resins, drying and non-drying alkyd resins, urea resins, coumarone indene resins and resinates. New modified phenolic and maleic resins give better self-colour and varnish stability, improved durability and reduce film yellowing and ageing. A new plasticizing alkyd resin is intended for use in urea and melamine stoving finishes where good colour stability, high gloss and freedom of striation are required.

B.R.P. supply polymers and resins derived from cashew nut shell liquid. These materials are used for both industrial and surface coating applications, in particular for the manufacture of brake linings and acid- and alkali-resisting cements.

Moulding materials.—The range includes phenolic, urea, cellulose acetate—and polystyrene compounds in two grades. Dystrene 80 is a crystal-clear material and Dystrene 200 is an improved form with special heat-resisting and toughness properties. Both types are also produced as colourant crystals.

This company is also one of the few producers of phenolic and urea extrusions.

Adhesives.—The range of synthetic adhesives includes phenol formaldehyde, resorcinol formaldehyde and urea formaldehyde types. A new adhesive has been developed for metal bonding.

Dohm, Ltd. **A28**
176 Victoria Street, London, S.W.1.

Reprocessed moulding materials, metallic coloured moulding materials and fillers; vacuum metallization for plastics.

COMPANIES in the Dohm Group include Grist Plastics, Ltd., and Almex, Ltd., Plastics Division, who reprocess all types of thermoplastics. The experience of the Group in the field of powder metallurgy has enabled them to offer a range of moulding materials with metallic colours such as silver and bronze. Other exhibits are wood-flour, silica and metallic powders for plastics compounds. A subsidiary company, A.E.R. (1938), Ltd., carries out the vacuum metallization process for the decorative coating of plastics mouldings and fabrications.

East Anglia Plastics, Ltd. **B14c**
52 Brook Street, London, W.1.

Thermoplastics moulding materials.

THIS Exhibition is the first time that the company's polyvinyl chloride compounds as well as their polystyrene materials are shown. Special attention is also given to a range of cellulose acetate injection moulding compounds.

Erinoid, Ltd. **B1**
Lightpill Mills, Stroud, Gloucester.

Casein, cellulose acetate and p.v.c. materials. Extrusion in standard sections or to specification.

THIS stand by Erinoid is shared with its associate companies, Styrene Products, Ltd., manufacturing a range of polystyrene moulding materials and Utilex, Ltd., who manufacture cellulose acetate film. Products featured by Erinoid are casein sheets, rods and tubes together with examples of articles produced from these materials. Cellulose acetate is available in the form of moulding powder, sheets and extruded sections, p.v.c. in the form of moulding powder, rigid sheeting and in extruded sections. A large display shows industrial applications of extrusions in both flexible and rigid grades, for the chemical, electrical, motor and other industries.

TABLE 3 — SHOWING RAW MATERIALS FOR PLASTICS

NAME OF COMPANY	Stand number	Synthetic resins								Plasticizers	Stabilizers	Colours and pigments	Solvents	Powder fillers	Laminate fillers	Adhesives
		Phenolic	Urea	Melamine	Alkyds	Polyester	Cashew	Epoxy	Vinyl							
BX Plastics, Ltd.	B10	..	..	..	X	..	..	..	..	..	..	..	..	..	..	X
Bakelite, Ltd.	B7	X	X	..	X	X	..	..	X	..	..	..	..	..	..	X
Birkbys, Ltd.	A5	X	..	..	..	..	..	..	..	X	X	X	X	..	..	..
A. Boake Roberts and Co. (Manufacturing), Ltd.	B8	..	..	..	..	..	..	..	..	X	X	X	X	..	..	..
British Geon, Ltd.	B2	..	..	..	..	..	..	..	X	..	..	..	..	..	..	X
British Industrial Plastics, Ltd.	B3 & 4	..	X	X	..	..	..	..	..	..	..	..	..	..	..	X
British Oxygen Co., Ltd.	B14b	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..
British Resin Products, Ltd.	B2	X	X	..	..	X	X	..	..	..	..	..	..	..	..	X
James Ferguson and Sons, Ltd.	B15	X	X	..	..	..	..	..	..	..	..	..	..	..	X	..
Fibreglass, Ltd.	B6b	..	..	..	..	..	..	..	..	X	..	X	..	..	X	..
The Geigy Co., Ltd.	B6f	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glass Yarns and Deeside Fabrics, Ltd.	B6h	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Imperial Chemical Industries, Ltd.	B12	X	X	..	..	X	..	..	X	..	..	X	X	..	..	X
Lankro Chemicals, Ltd.	B6d	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..
Chas. Lowe and Co. (Manchester), Ltd.	B14g	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..
Monsanto Chemicals, Ltd.	B14a	..	..	..	..	..	..	..	..	X	..	..	..	..	..	X
Scott Bader and Co., Ltd.	B14f	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..
Shell Chemicals, Ltd.	B14e	..	..	..	..	..	..	X	..	X	..	..	X	..	..	..
Wiggins Teape and Alex Pirie (Sales), Ltd.	B13	..	..	..	..	..	..	..	..	..	..	..	..	X	X	..
Williams (Hounslow), Ltd.	B6a	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..
J. H. Vavasseur and Co., Ltd.	B14h	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..

James Ferguson and Sons, Ltd. **B15**
Lea Park Works, Prince George's Road, Merton Abbey, London, S.W.19.

Phenolic and urea moulding materials and resins.

A RANGE of Nestorite phenolic and urea moulding materials is displayed together with examples of mouldings produced by various manufacturers for applications in different industries. Synthetic resins for other applications are also demonstrated.

Fibreglass, Ltd. **B6b**
Ravenhead, St. Helens, Lancashire.

Glass fibres for reinforcement of plastics.

A RANGE of products produced from glass fibres particularly for the reinforcement of plastics material and polyester resins consist of woven glass cloth, chopped strand mat, diamond mat, rovings, surfacing mat, tape and chipped strands. Together with these products one or two examples of finished glass fibre reinforced mouldings are shown but the company states that the stand is intended primarily as an information centre, rather than as a collection of exhibits.

The Geigy Co. Ltd. **B6f**
Rhodes, Middleton, Manchester.

Plasticizers and colours.

THE new Reoplex range of polyester plasticizers is of particular interest for use in p.v.c. compounds and synthetic rubbers where resistance to migration and to extraction by oils, fats and solvents are of importance. Conventional ester-type plasticizers include the fire-resistant aryl phosphates such as tritolyl phosphate, and sebacate plasticizers such as dioctyl sebacate, which are of special interest for low-temperature work. Colours for plastics are also exhibited, and in this connection the Geigy Co. Ltd. have developed a range of pigmentary colours of special interest.

Glass Yarns and Deeside Fabrics, Ltd. **B6h**
Craven House, 121 Kingsway, London, W.C.2.

Glass fibres and woven materials.

A NUMBER of products made from glass filaments both woven and un-woven are of special interest for reinforced synthetic resin materials. Actual exhibits show various fillers—glass fibre, glass mats, rovings and woven cloth. Certain other monofilaments and cloths are also of interest outside the plastics industry. One specially woven is resistant to creasing and subsequent fracture and is capable of being draped thus making it suitable for curtains, etc., where fire-proof material is required.

Holoplast, Ltd. **B16**
New Hythe, Near Maidstone, Kent.

Laminates, structural phenolics and roofing materials.

THE most recent addition to the range of building materials produced by this company is "Decorplast," decorative laminate. It is available in two thicknesses, 1/20 in. and 1/10 in., both with a sanded finish on the reverse side for easy adhesion. The full size of the sheets is 96 in. by 48 in. and the surface pattern—a small herringbone—is available in red, pastel blue, pastel pink, pastel green and buff. Holoplast structural cavitied panels $1\frac{5}{8}$ in. are used principally for internal partitions; a slightly thicker version $1\frac{11}{16}$ in. thick is used for external walls. "Corroplast," corrugated phenol formaldehyde laminates are used for roofing and are finding outlets in the shipbuilding industry for permanent ships awnings, where their corrosion resistance is of particular value.

Imperial Chemical Industries, Ltd. **B12**
Black Fan Road, Welwyn Garden City, Herts.

Raw materials for the plastics industry.

OF the many materials produced for the plastics industry by the company a number will be given special features on this stand. These will be "Mouldrite" foundry resins including phenolic and urea resins for core bonding and phenolic resins for shell moulding. "Nuron" polyesters are also used for foundries for carrying cores cured by H.F. heating. "Fluon," polytetrafluoroethylene, has remarkable electrical and thermal properties and its specialized applications in industry are being demonstrated. Rigid p.v.c. sheet produced by I.C.I. which has recently been given the name "Darvic" is being widely used for fabricating components ranging from refrigeration panelling to lighting fittings. The other materials shown include polythene, nylon, p.f. and u.f. moulding powders.

Kleestron, Ltd. **B14d**
West Halkin House, West Halkin Street, Belgrave Square, London, S.W.1.

Polystyrene moulding powder.

THE only product featured on this stand is Kleestron polystyrene moulding powder. A number of mouldings produced from this material are displayed.

Lankro Chemicals, Ltd. **B6d**
Bentcliffe Works, Salters Lane, Eccles, Manchester.

Plasticizers, stabilizers and colours for p.v.c. sheeting.

A LARGE number of plasticizers for compounding p.v.c. are shown: di-2-ethyl hexyl phthalate, di-alkyl phthalate 79, dibutyl phthalate, di-2-ethyl hexyl sebacate, di-alkyl sebacate 79, butyl acetyl ricinoleate, methyl acetyl ricinoleate, butyl laturate and butyl stearate. The stabilizers manufactured by the company are all of the ricinoleate type, e.g., barium, cadmium and calcium ricinoleate. These are supplied in solution in di-2-ethyl hexyl phthalate. Two modified plasticizers are Lankroflex 18 which is a modified octyl phthalate, and Lankroflex 28 which is a modified alkyl 79 phthalate. Although still in their infancy, these plasticizers have been found very satisfactory in bulk usage.

Charles Lowe and Co. (Manchester), Ltd. **B14g**
Reddish, Stockport, Cheshire.

Synthetic resins, particularly phenolic and cresylic resins.

EXHIBITS on this stand show how "tailor-made" resins developed for specific purposes are used in many fields of industry. These include a Permali tap change terminal board, large diameter laminated tubes made by Ferranti, clutch discs, friction blocks, abrasive bonds and discs and grinding wheels. Other resins are used for foundry cores, wallboard, textile treatment, etc.

TABLE 4 — SHOWING PLASTIC MATERIALS FOR MOULDING, EXTRUSION AND FABRICATION

NAME OF COMPANY	Stand number	Moulding powders			Moulding or extrusion compounds							Polyester resins	Thermoplastic sheet, film, rod and tube							Laminates	
		Phenolic	Urea	Melamine	Cellulose acetate	Acrylic	Polystyrene	Nylon	P.t.f.e.	Vinyl compounds	Polythene		Casein	Cellulose acetate	Cellulose nitrate	Acrylic	Polystrene	Polythene	Rigid vinyl	Industrial	Decorative and structural
BX Plastics, Ltd.	B10	..	..	..	X	..	..	..	..	..	..	..	X	X	X	X	X	X	X	..	..
Bakelite, Ltd.	B7	X	X	..	..	..	X	..	..	X	..	X	..	..	..	..	..	..	X	X	..
Birkbys, Ltd.	A5	X	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..
British Industrial Plastics, Ltd.	B3 & 4	..	X	X	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..
British Resin Products, Ltd.	B2	X	X	..	X	..	X	..	..	..	..	X	..	..	..	..	..	..	..	..	..
Dohm, Ltd.	A28	..	..	..	X	..	X	..	..	X	X	..	..	..	..	..	..	..	..	..	..
East Anglia Plastics, Ltd.	B14c	..	..	..	X	..	X	..	..	X	..	..	..	..	..	..	..	..	..	..	..
Erinoid, Ltd.	B1	..	..	..	X	..	..	..	..	X	..	..	X	X	..	..	..	..	X	..	..
James Ferguson and Sons Ltd.	B15	X	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Holoplast, Ltd.	B16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X
Imperial Chemical Industries, Ltd.	B12	X	X	..	..	X	..	X	X	..	X	X	..	..	..	X	..	X	X	..	..
Ioco, Ltd.	B6c	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Kleestron, Ltd.	B14d	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Lacrinoid Products, Ltd.	A24	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Monsanto Chemicals, Ltd.	B14a	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Scott Bader and Co., Ltd.	B14f	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..
Styrene Products, Ltd.	B1	..	..	..	..	..	X	..	..	..	..	..	..	..	..	..	..	..	..	..	..
The Telegraph Construction and Maintenance Co., Ltd.	A14	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	X	..	..	..
Tufnol, Ltd.	B17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X	..
Utilex, Ltd.	B1	..	..	..	..	..	..	..	..	..	..	..	..	X	..	..	..	..	..	..	..
Warerite, Ltd.	B7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	X

Monsanto Chemicals, Ltd. **B14a**
Victoria Station House, Victoria Street, London, S.W.1.

Polystyrene moulding material, adhesives, plasticizers.

LUSTREX MI (medium impact) strength is the latest form of Monsanto's polystyrene. It has higher impact strength and better elongation at break and deflection than general-purpose polystyrene, but retains high surface finish and flexural and tensile strengths. It can be moulded in standard equipment and can be milled, drawn and sawn. It is pelleted and lubricated for optimum mouldability and is supplied in a range of opaque and translucent colours. Besides this new grade and the general-purpose material, a colourant blend is shown for use with the dry colouring process whereby moulders colour their materials on their own premises. A display of moulded products demonstrates the applications of these materials.

Aroclors, chlorinated diphenyls, are shown for their flame-resistant properties when used as plasticizer extenders in p.v.c. cable covering, industrial beltings, etc.

Scott Bader and Co., Ltd. **B14f**
Wollaston, Wellingborough, Northants.

Polyester casting and laminating resins.

CRYSTIC and Marco polyester resins are shown, together with some examples of structures made by laminating glass fibre with these resins. A notable example is the one-piece moulding of a car bonnet with front wings. Several types of corrugated sheeting can be seen in a number of different colours. The number and type of corrugation can be varied, the only governing factor being the width of the glass fibre mat. Some examples of light furniture made in Switzerland from Marco resins can be seen. Scott Bader do not carry out laminating work themselves but are in a position to advise users as to the most suitable techniques for their requirements.

Shell Chemicals, Ltd. **B14e**
Norman House, 105/109 Strand, London, W.C.2.

Petroleum chemicals for the plastics industry.

THE "Epikote" range of epoxide resins which have been available in small quantities for experimental purposes during the past 18 months are now available without restriction. Some finished products, charts and diagrams on the stand show the use of these resins in casting and potting, particularly for electrical components, as low-pressure laminating resins for glass-cloth, for foamed in situ compositions, in adhesives and as stabilizers for p.v.c. The use of di-allyl phthalate in moulding powders is shown, as well as Alphanol and Nonanol for plasticizers and for solvents.

Styrene Products, Ltd. **B1**
96 Piccadilly, London, W.1.

Polystyrene moulding powder.

SHARING the stand with Erinoid, Ltd., who are marketing agents for this company, Styrene Products, Ltd., are showing five grades of polystyrene for all purposes. These are K.L.P. general-purpose material for low cost quantity production; H.S. heat resistant material for coiled formers, bobbins, household ware, radio cabinets for tropical use and other applications where heat resistance is required; 2.C.L. high molecular weight polystyrene for use where a slightly tougher material is required, e.g., waxed carton clips and battery components; M.H.I. medium impact material having an impact strength approximately twice that of K.L.P. grades, available in translucent and opaque colours including metallic shades, suitable for refrigerator components, textile pirns, etc.; and finally H.I. grade which has an impact strength some four to five times of normal polystyrene and an appreciably greater elongation, this grade being particularly suitable for moulding battery boxes and structural parts for refrigerators.

Tufnol, Ltd. **B17**
Perry Barr, Birmingham, 22B.

Engineering laminates and fabrications.

TUFNOL synthetic resin bonded laminates both paper and fabric based are shown in the form of sheets, tubes and rods together with fabrications made from them. These end products for the engineering and electrical industries have been produced partly with conventional engineering tools from the standard laminates, whilst others have been specially moulded to shape during manufacture. The design and layout of the stand is intended to encourage engineers to come and discuss how Tufnol can help with design and production problems.

United Ebonite and Lorival, Ltd. **A30**
Little Lever, Near Bolton, Lancs.

Calendered p.v.c. sheet.

BESIDES the moulding and fabricating activities of this company, which are described in another section of this supplement, Lorival produce a range of calendered p.v.c. sheeting for use in curtains, table covers, etc., Other applications which are featured are the use of Lorival sheeting for industrial aprons, protective clothing and for packaging.

Utilex, Ltd. **B1**
Mill Street, Kingston-on-Thames, Surrey.

Cellulose acetate sheets and films.

A FULL range of cellulose acetate sheets and films, in clear transparent, coloured transparent and opaque grades are shown. These materials are available in sheets or reels up to a thickness of 0.020 in. Reels can be slit widths from ½ in. upwards and standard reels are available from 20 in. to 40 in. wide. The latest product of this company is metallized acetate film.

J. H. Vavasseur and Co., Ltd. **B14h**
15 America Square, London, E.C.3.

Coconut shell flour fillers for moulding materials and adhesives.

VAVANITE filler made from coconut shell has been successfully used as a filler for phenolic moulding materials and such mouldings are displayed on this stand. Other exhibits show articles moulded with 15 per cent. Vavanite extenders which compare favourably with articles moulded from standard materials.

Warerite Ltd. **B7**
Ware, Herts.

Decorative laminates.

THE products of this subsidiary of Bakelite Ltd. are featured on the Bakelite stand, where considerable use of Warerite materials has been made in the actual construction. These laminates are finding extensive use in shipbuilding, as well as in furniture production and building.

Wiggins Teape and Alex Pirie (Sales), Ltd. **B13**
Aldgate House, Mansell Street, London, E.1.

Paper for the plastics industry, especially base papers for decorative and industrial laminates.

THE stand portrays the development of paper making from the foundation of the Wiggins Teape Group in 1761, showing the change from hand-made paper to modern production methods. The range of papers for the plastics industry includes plastic-treated belt interlining paper, glass content papers, decorative paper for laminates and paper for industrial laminates. Other products are leathercloth base papers, glass content paper fillers and bases for coated papers. The staff in attendance have been specially chosen and are qualified to deal with technical and development inquiries on the uses of paper in the industry.

Williams (Hounslow), Ltd. **B6a**
Hanworth Road, Hounslow, Middlesex.

Colouring materials for moulding powders.

POLLENE colours developed for the dry colouring of polystyrene moulding materials are the main theme of this stand. A new unit pack has been developed consisting of a container holding the exact amount of colour required to produce a standard shade in 50 lb. of polystyrene. Some 30 standard transparent and opaque colours are available and these can be seen on the stand together with the coloured moulding materials. Another product displayed is spirit Nigrosine for incorporation in moulding powders to give an intense black.

BIOGRAPHICAL NOTES ON LORD HALSBURY, THIS YEAR'S INAUGURAL LECTURER

THE inaugural lecture this year is to be given by the Earl of Halsbury, F.R.I.C., F.Inst.P., who since 1949 has been managing director of the National Research Development Corporation, which was set up under the Development of Inventions Act, 1948. Born in 1908, Lord Halsbury took a B.Sc. degree with first-class honours in chemistry. Specializing in the chemistry of oils and fats, his first industrial appointment was with Lever Brothers at Port Sunlight and elsewhere. During the war, at the research laboratories in Sheffield of Firth Brown, he worked on the design of special steels for the blades of gas turbines and jet engines.

Lord Halsbury has been a member of the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research since 1949, and the chairman of the Science Museum Advisory Council since 1951. He is also a vice-president of the Parliamentary and Scientific Committee.

Lord Halsbury is the grandson of the first Earl, who was three times Lord Chancellor and author of the legal classic "Halsbury's Laws of England."

British Plastics Convention, 1953

The Second British Plastics Convention is being held at Olympia, concurrently with the British Plastics Exhibition. Summaries of some of the papers being presented were published in "Plastics" last month. Below is given the full programme of the Convention together with summaries of the remainder of the papers.

INAUGURAL ADDRESS

MONDAY, JUNE 8, 4 P.M.

Chairman: C. S. Dingley, *Chairman of the British Plastics Federation, Director of British Industrial Plastics, Ltd.*

The Right Hon. the Earl of Halsbury, F.R.I.C., F.Inst.P., managing director, the National Research Development Corp.

UNPLASTICIZED P.V.C.

TUESDAY, JUNE 9, 10.15 A.M.

Chairman: J. C. Swallow, *Division Chairman, Imperial Chemical Industries, Ltd. (Plastics Division).*

Problems Related to the Manipulation of Unplasticized Polyvinyl Chloride. By J. J. P. Staudinger, Dr.Ing., Director, British Resin Products, Ltd.

Industrial Applications of Unplasticized P.V.C. By J. S. Byers, Technical Service and Development Department, Imperial Chemical Industries, Ltd. (Plastics Division).

PLASTICS MATERIAL DEVELOPMENTS

TUESDAY, JUNE 9, 2.30 P.M.

Chairman: *H. V. Potter, Chairman and Managing Director, Bakelite, Ltd.*

Recent Commercial Development of Melamine and Guanamine Resins. By F. J. Mills, M.Sc., Ph.D., Technical Sales Manager, Chemicals Division, The British Oxygen Co., Ltd.

Moulded and Extruded Polyamides and Polyesters. By W. C. Ferguson, B.Sc., Ph.D., Technical Service and Development Department, Imperial Chemical Industries, Ltd., Plastics Division.

Silicones in the Plastics Industry. By J. H. E. Jeffes, B.Sc., Manager, Technical Service Department, Midlands Silicones, Ltd.

REINFORCED PLASTICS—1

WEDNESDAY, JUNE 10, 10.15 A.M.

Chairman: N. A. de Bruyne, *Managing Director, Aero-Research, Ltd.*

Surface Chemistry and Adhesion of Glass and Plastics. By H. Cole, M.A., F.R.I.C., F.S.G.T., Deputy Chief of Research, Pilkington Brothers, Ltd.

Plastics Containing Asbestos as a Reinforcing Filler. By P. H. Bishop, B.Sc., J. E. Gordon B.Sc., and P. L. McMullen, D.L.C. (Aero.Eng.), Royal Aircraft Establishment, Farnborough.

A Critical Survey of Commercial Low-pressure Laminating Resins. By V. E. Yarsley, D.Sc., F.R.I.C., F.P.I., and A. G. Goodchild, B.Sc., A.R.I.C.

REINFORCED PLASTICS—2

WEDNESDAY, JUNE 10, 2.30 P.M.

Chairman: G. F. Bassett, *Managing Director, Ashdowns, Ltd.*

Some Considerations in the Design and Manufacture of Structures in Glass Reinforced Plastics. By G. C. Hulbert, B.Sc., Development Engineer's Department, Bristol Aeroplane Co., Ltd.

Some Problems Associated with the Design and Manufacture of Asbestos-reinforced Plastics Structures. By D. S. Bancroft, A.F.R.Ae.S., Assistant Chief Designer, F. G. Miles, Ltd.

DURABILITY AND PERFORMANCE—1

THURSDAY, JUNE 11, 10.15 A.M.

Chairman: N. J. L. Megson, *Head of Chemistry Department, R.A.E., Farnborough.*

The Durability of Plastics Under Post Office Conditions. By A. D. W. Downes, B.Sc., F.R.I.C., and A. A. New, M.Sc., F.R.I.C., Post Office Engineering Department.

DURABILITY AND PERFORMANCE—2

THURSDAY, JUNE 11, 2.30 P.M.

The Durability of Adhesives for Wood. By R. A. G. Knight, B.Sc.(Eng.), M.I.Mech.E., Officer-in-Charge, Composite Wood Section, Forest Products Research Laboratory.

SELLING TO THE PUBLIC

FRIDAY, JUNE 12

Chairman: T. L. Birrell, *President of the Plastics Institute, Managing Director of Hale, Ltd.*

Merchandizing of P.V.C. Film and Related Products. By R. M. L. Baxter, Sales Manager, Greenwich Leathercloth Co.

Early production problems in the manufacture of p.v.c. film caused faulty and imperfect film, resulting in public distrust. Faced with this, certain big manufacturers, with large-scale production units determined to produce only the best, despite the irresponsible activities of others operating inadequate and uncontrolled factories. At the same time efforts were made to develop consumer confidence by the use of brand names, the introduction of B.S. 1763 and the Kite Mark. The use of the Good Housekeeping Mark, publicity through press and trade exhibitions, also helped increase public confidence.

The acceptance of p.v.c. film by the public, and the trade, as a material having its own special applications and place in every day life, is a most important development. It is no longer regarded as a substitute. Direct consumer demand is being further increased as a result of marketing p.v.c. film with metallic finishes, embossed effects, printed effects, and latterly, photogravure printed and laminated films.

Also contributing to the current demand for film is the acceptance, as a result of sound mechandizing, of uses by industries other than the rain-wear and making-up trades, examples being the pharmaceutical, electrical, sealing tape and packaging industries. There is a need for specially formulated p.v.c. films and skilled technical salesmen when developing such fields.

Polyvinyl chloride film sales have great possibilities of expansion ahead, but this can only be undertaken by maintaining a high standard of quality, retaining consumer confidence and the persistent education of the public and industry as a whole, coupled with the sound merchandizing of each new development after it has been fully approved by exhaustive laboratory tests.

Marketing of Melamine Tableware. By H. A. Brooks, Product Design Service, British Industrial Plastics, Ltd.

The paper will be of an essentially practical nature. It will report the results of the first field tests of melamine ware made in this country by the speaker's firm in collaboration with moulder interests and well-known London stores. The paper will endeavour to suggest the potential market that exists for melamine ware; will deal with design and moulding technique; washing and handling considerations; and will indicate the economics of melamine ware in practical use in catering establishments.

Plastics in the Toy Industry. By W. Graeme Lines, Sales Director of Lines Brothers, Ltd.

The material from which a toy is made is a secondary factor in selling, though not in manufacture. It is important in so far as it enables the manufacturers to answer the questions which arise when a new toy is designed or an old toy remade in a new material.

These questions concern play value, representation, strength, colour and reputation of the material in the public's eye. Price is vitally important, but must be considered in relation to quality. Even if the highest quality toy is made from an expensive material, it may fail to be a commercial proposition because the selling price is too high.

The qualities which make good toys are strength, colour, weight, finish and resistance to heat and cold. These points are discussed by the speaker in relation to plastics.

It is probable that, in the toy field, the greatest usefulness of plastics is in the finish obtained. This is especially true of detail reproduction which is expected of so many toys, and which can be obtained by moulding in plastics.

The introduction of plastics to the toy trade, it is concluded, has added to the salesman's armoury, but they should be considered as additions to the manufacturer's range and not as substitutes.

Design in Plastics—Whose Responsibility? By Paul Reilly, Council of Industrial Design.

Ever since the 1851 Crystal Palace Exhibition critics and reformers have bewailed the vicious circle of public taste and have vainly tried to pin responsibility on the manufacturer, or on the distributor or on the consumer. No matter what the industry there is always someone else to be blamed. And on close inspection one discovers that in many industries there is no such being as the manufacturer on whom to pin responsibility. The structure of most industries, from the design point of view, is such a tissue of loopholes that the buck will go round and round within the industry just as elusively as, on the larger canvas, it passes from maker to retailer to customer and back.

This is particularly true of the plastics industry which in its time has been accused of all the crimes in the design calendar. But who are the members of the plastics industry who do these dreadful things? Are they the big resin-producing chemical companies? Surely not, for they sell their powders and compounds to moulders and fabricators. Are they then these moulders and fabricators? Again surely not, for most moulders sell a service, not a product; they mould to their customers' designs.

And who are these customers? As often as not they are merchants and factors and wholesalers serving a variety of trades with many lines of merchandise and plastics is but one of the materials in which they deal. Here, then, we may find the culprit but he is strictly not a member of the plastics industry.

But how can the reputation of plastics be safeguarded if the men who design and market plastics products have little or no stake in the industry?

There are three possible answers: first, more active interest in the end-product by the raw material suppliers, more "policing of the end product," as they say in the United States, and more service and leadership from the great chemical companies in giving design advice and offering models to their customers.

Secondly, an extension of moulders' proprietary lines; if a moulder has to market what he moulds, the old excuse "my customer right or wrong" will not save him from the penalties of neglecting design.

And lastly, concerted design research by the industry, especially into the vital question of decoration; designers in plastics must devise new forms of moulded or embossed decoration.

The path of the plastics designer is strewn with pitfalls. When his materials will accept almost any pattern or texture and any colour, when they can be given almost any shape, the designer must be on his guard against the human failing of endowing humble objects with fictitious grandeur or, as Mathew Digby Wyatt put it in 1851 when criticizing the Crystal Palace exhibits, against "borrowing ornaments expressive of lofty associations and applying them to mean objects."

The successful plastics designer must combine to a high degree both engineering skill and aesthetic taste; it is a rare combination that cannot be bought for a song. When found he must be given a proper standing in his company and paid accordingly and that is the responsibility of management. Designers alone cannot improve standards; they must have the backing of their directors. There can be little improvement unless the boss himself takes a lively interest in design—and that goes for all industries, not only plastics.

MOULDING—1

MONDAY, JUNE 15, 2.30 P.M.

Chairman: T. Butler, *Chief Development Engineer, British Industrial Plastics, Ltd.*

A Study of the Problems Involved in High-quality Injection Moulding. By E. Gaspar, Dipl.Ing., A.M.I.Mech.E., Chief Designer, Projectile and Engineering Co., Ltd.

The application of the injection moulding process is being continuously extended with the increasing range of available materials. Thus, the ever widening field of application of injection moulding for exacting requirements has brought about a number of problems for the moulded. As a result of this it has been realized that the rate and homogeneity of plasticization, injection temperatures and rate of injection, etc., play a very important role.

An extensive series of tests have been carried out in order to clarify some of these points. The field of inquiry was concentrated on:—

(a) Ascertaining true plasticizing capacity and pressure drop in the heating chamber.
(b) Influence of material pressures, temperatures and speed of injection during the cycle.

The tests for measuring the true plasticizing capacity of heating chambers were carried out in order to find out the temperature gradients between control temperature and mass average temperatures and also temperature fluctuations as a function of plasticizing rate. These experiments have been carried out with two different types of plasticizing chamber and certain conclusions drawn as to the important factors in design which influence their efficiency.

In order to obtain the true injection pressure which is available at the nozzle, further tests have been carried out to determine the static pressure drop in heating chambers. The influence of material temperatures on these pressure drops have also been investigated. Comparisons are made between conventional heating chambers and pre-plasticizers and their influence on the quality of the mouldings.

In cases of difficult mouldings the avoidance of moulding defects and internal stresses depend upon a delicate balance of cavity pressures and temperatures. These temperature and pressure variations are analysed and their importance stressed. It is suggested that this information should be available for every type of heating chamber.

Further tests have covered injection moulding into a cavity with a large area and thin wall, creating artificially difficult moulding conditions. The influence of injection pressures, temperatures, rates of injection and cycle time on the properties of the moulded material have been investigated and certain conclusions are drawn.

Finally, tests have been carried out in order to reduce internal stresses in the moulding, and as a result of these tests certain suggestions are put forward.

It is emphasized that injection moulding has now become a science and the true appreciation of the factors influencing the quality of mouldings and production speed can be of great assistance to the moulder in the future, particularly with intricate mouldings and new materials.

MOULDING—2

TUESDAY, JUNE 16, 10.15 A.M.

Chairman: J. Lionel Daniels, *Man. Dir., T. H. and J. Daniels, Ltd.*

The Economics of Large Injection and Compression Moulding Machines. By David Radford, Executive Director and General Manager, E. K. Cole, Ltd.

The paper deals with the increased intricacy of moulding techniques as the size of the component increases.

On the thermoplastic side, it appears that about 120 oz. may be the limit by methods understood today, bearing in mind that machines occupying 200 sq. ft. and costing probably £20,000, have only 3 lb. shot weight capacity today. The output of large components, when moulded, is so high relative to the magnitude of the orders that one must question the economics of the tooling charges involved.

Although compression presses are in existence up to 2,000 tons, mouldings of about 25 in. square are about the largest which can be produced if there is to be any appreciable depth, as in a television cabinet for example, although within reason the weight of the component which can be produced is unlimited.

In this direction plant development is today very limited, and the position appears to be much more stable.

Pre-heating or pre-plasticizing will add considerably to the size of mouldings, and in the case of injection moulding may even mean an increase of 100%. The problem of heating is discussed, and the necessity for obtaining a large mass of steady heat for long periods, rather than intermittent surges of high localized heat.

The question of the higher pressures needed, the increased residual strains in mouldings, and the greater need for temperature control in the moulding tool is discussed.

Possible alternative methods of moulding such as the building of auxiliary injection units for compression presses, and the economics of the Archimedes screw principle is discussed, where as on the compression side the adoption of new powders with faster cures, and lower moulding pressures, is considered as a possible answer to the question of supplying extra capital equipment.

In this direction the speaker gives his views on surface finish, such as ripple and colour separation, and the resulting increases in the cost of scrap when these newer techniques are employed.

Tooling is discussed, the strengths and prices of which, at this stage, seem to be

somewhat indeterminate by calculation, experience being the greatest guide. One must also remember the costs of handling tools, and material waste in sampling, and readily appreciate the need to reduce the "ups and downs" of tools with a view to getting greater production. Various component design features will be mentioned, such as increased draft owing to the greater linear shrinkage and the reduction of irregular sections.

Mould feeding techniques with a view to effecting economies in finishing are considered. This is followed by a section on the moulding cycles and inter-cycle operations for producing components, and a description of some of the large mouldings in which experience, often discouraging, has been obtained.

Finally, the future of large mouldings and possible development of techniques is discussed, and the influence of economic factors, surely the beginning and ending of all successful business, is considered.

NEW USES IN INDUSTRY—1

WEDNESDAY, JUNE 17, 10.15 A.M.

Chairman: P. A. Delafield, *director, British Geon, Ltd. and British Resin Products, Ltd.*

Plastics in the Telecommunication Cable Field. By R. C. Mildner, M.Sc., M.I.E.E., H. F. Wilson, B.Sc., A.R.I.C., A.I.R.I., and E. I. Cooke, M.A., B.Sc., A.R.I.C., Telegraph Construction and Maintenance Co., Ltd.

The cables in question have been considered in the following groups—submarine, land telephone, land signalling and high frequency.

The first long-distance communication by means of insulated electric cable was between this country and France in 1850 using the naturally occurring thermoplastic, gutta percha, as the insulation for underwater use. For the next sixty years gutta percha remained the chief material in the plastics industry not only for cable manufacture but also for general moulding purposes. It had, however, its shortcomings—notably its softness and high permittivity, and many artifices were employed to improve these characteristics, giving us Paragutta, K-gutta and Telecomax. When polythene became available, the need for such so-called "improved dielectric materials" disappeared.

For land communication cables, paper/air dielectrics when kept dry have advantages over polythene and polystyrene in that they may possess lower permittivities. The latter thermoplastics have, however, other attractive features and in the hands of the cable maker they can be used to advantage so that an economic cable can be made. We shall undoubtedly see an increased use of plastic telephone cables in the future.

The contribution of plastics to radio frequency cables is universally recognized. The advanced development of radar in this country during the war proved to be a most powerful weapon, and the possession of robust, flexible, radio-frequency cables capable of carrying high power made an invaluable contribution to this development.

The cable maker is often forced to adapt his design to overcome the limitations of his raw materials and some of the solutions to these problems are discussed. These problems may be concerned with deficiencies in the properties of the materials available, their uneconomic cost or the close dimensional manufacturing tolerances which are sometimes demanded.

The deficiences of the commonly used plastics from the viewpoint of a cable maker are discussed, and it is optimistically suggested that the chemical industry will in due course be able to provide the cable and plastics industries with tailored molecules which will more nearly suit every purpose, both electrical and mechanical.

The Metal Coating of Plastics by Vacuum Evaporation for Functional and Scientific Purposes. By L. Holland and N. Sutherland, B.Sc., Research Laboratory, W. Edwards and Co. (London), Ltd.

The functional applications of vacuum evaporation in the plastics industry are divided into two main sections. The first of these deals with those coatings which are used for imparting certain optical properties to plastics surfaces and includes an extensive discussion on the coating of Perspex optical components such as mirrors and lenses.

The second section is concerned with the metal finishing of plastics for obtaining surface conductivity as required for condensers and the prevention of surface charging. In conclusion the resistance stability of thin metal films on plastics substrates is discussed.

NEW USES IN INDUSTRY—2

WEDNESDAY, JUNE 17, 2.30 P.M.

Chairman: P. A. Delafield

Plastics in the Footwear Industry. By W. E. Booth, B.Sc., Physics Department, The British Boot, Shoe and Allied Trades Research Association.

Shoe-making is basically a craft industry. Its processes were mainly developed with leather as the raw material. From earliest times there has been a search for something new and a variety of materials have been used for shoes. Alternatives, to pass beyond the novelty stage and find general acceptance for good quality work must compare with leather in workability, appearance, comfort and durability as well as being an economic proposition.

The fibrous nature of leather allows it to be conformed on the last by stretching and compressing relatively easily to make a shoe which retains the shape necessary for it to fit the complex contours of the human foot. Plastics materials are more uniform and therefore easier to cut into components than leather, but generally speaking those used in the shoe trade in this country at the present time cannot be moulded so readily by conventional shoe-making methods. New methods of construction are introduced from time to time, but those which are well established are used for the production of the major proportion of the output of the industry. The suitability of a material for making up by means of standard machinery is therefore of importance. The appearance of a component in a completed shoe depends not only on its colour and finish but also less obviously on the way it retains the shape of the last on which it is moulded, this in turn being dependent on the strength, stretch and plasticity characteristics of the material. Plastics with finishes of undoubted sales appeal are now available but the second point has probably had less attention. When comparisons are being drawn between leathers and plastics materials the question of their relative merits from the point of view of foot comfort is likely to be raised but for the present the issue remains controversial. Plastics are generally impermeable it is known but shoes can be designed with this in mind. They have the advantage over leather that they are not susceptible to perspiration attack although examination of worn shoes has shown that their service life is limited by other factors. It would be misleading to draw comparisons with leather too far. There are few applications where plastics are alternatives to other materials.

The use of plastics in the shoe industry is not likely to show a spectacular increase but they have a place. The requirements are perhaps different from those of other industries and there is scope for the development of materials specifically formulated to meet them.

It is intended that the paper should include a reference to the application of plastics in the shoe industry, an outline of the processes of manufacture with reference to the problems arising in the use of plastics, the behaviour of these materials in wear and some of the experimental work which is being carried out with the co-operation of plastics and shoe manufacturers.

Flame-proof Conveyor Belting. By S. J. Skinner, Ph.D., B.Sc., A.I.R.I., Sales Manager, British Geon, Ltd.

During the period 1940 to 1950, some 75 fires were reported as having occurred on underground conveying equipment, and the disaster at the Cresswell Colliery, in September, 1950, resulting in the loss of 80 lives, finally focused attention on the necessity of providing non-inflammable material for conveying purposes.

Previous work on this subject in Holland and Germany did not deal adequately with the underlying cause of conveyor fires, which is really the use of readily inflammable material as the coating and bonding agent for the fabric belt.

This paper deals mainly with the use of materials other than natural rubber for belting manufacture, and it is concluded that, given proper equipment, satisfactory belts can be made using (1) polyvinyl chloride plasticized substantially with tricresyl phosphate, or (2) polyvinyl chloride plastics in which a percentage of plasticizer is replaced by a nitrile rubber.

Problems in manufacture are discussed in some detail as well as methods of tests, and the possibility of producing non-inflammable natural rubber compounds suitable for conveyors is discussed.

Glass-reinforced Plastics—
Recent Changes and Developments

By D. G. HODGSON* and G. ADER*

Improved and cheaper resins, more glass reinforcing materials, and improved manufacturing techniques, are changing the production of glass-reinforced plastics from an experimental back-room development to an organized mass-production industry. The article below is followed by a summary of polyester chemistry and two features showing specific applications of both glass-reinforced and asbestos-reinforced plastics.

ALMOST 10 years ago reports of glass fibre-reinforced polyester resin laminates began to appear in the American technical Press, and several years ago a number of fabricators in this country first started to produce experimental laminates with these new materials. Yet even a year or two ago glass fibre-reinforced laminates or mouldings actually in use in this country were restricted almost entirely to a few applications in the aircraft industry. There is no doubt that the emergence of glass-reinforced plastics has been an outstanding feature of the post-war period. But rarely has a new development which seemed to hold out so much promise of large-scale expansion been so slow in coming to fruition. It cannot be said that the efforts which have been expended by those concerns specializing in this new branch of the plastics industry have been in vain; valuable techniques have been perfected and many applications evaluated. But until comparatively recently, the growth of the industry has been disappointingly slow. One is led to ask, therefore, what were the causes of this slow development, in what way the picture has altered in recent months and what are the prospects of more rapid progress in the future.

The answer to the first question is mainly one of economics. For the aircraft industry and a few other fields of application, the price factor is often immaterial. But in most other industries glass-reinforced plastics must compete against articles made of other materials and even if eminently suitable for a particular application, the price must be "right for the job." Until fairly recently this has not been the case, chiefly, although not exclusively, due to the high cost of resins and especially glass fibre. The suitability of the available glass reinforcements also left much to be desired. But in recent months a marked change had occurred. To illustrate this change one may compare some of the facts a fabricator had to face some 18 months ago with those that face him today.

Reinforcing Materials

About a year and a half ago, the only types of glass fibre reinforcing materials available in bulk were in the form of continuous filament woven cloth in the loom-state. A limited range was obtainable from two U.K. sources, nearly all finely woven, high-strength cloths as specified for aircraft applications. They were high-priced materials costing in the region of 16s. per lb. of cloth. Thus, based on the then prevailing price of 6s. to 7s. per lb. of polyester resin and on the relatively high labour charges and wastage of materials associated with the production techniques then employed, a rough calculation shows the cost of a finished article to have been in the region of 30s. per lb. weight.

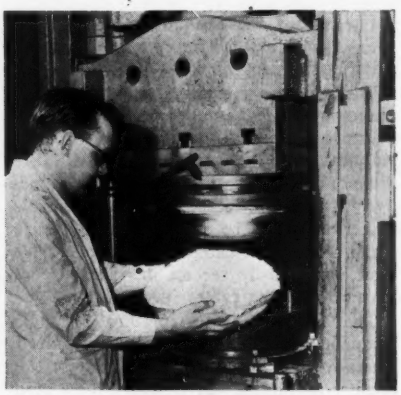
The picture today is very different. Amongst the range of commercially available continuous filament woven cloths, there are now several grades specially designed for the low-pressure reinforced plastics industry. There are, for instance, the "satins," which give very high strength in any desired direction to any desired degree, or the thick open "scrims," which allow easy moulding around complicated contours and a rapid build-up of the desired thickness of laminate. These are, of course, still relatively high-priced materials, although even here some improvement has occurred and "scrims" are now selling at around 10s. per lb.

A further development has been the availability of specially treated cloth. Today a fabricator can purchase glass cloth from which the sizing material has been removed by any one of several desizing processes. He can also buy, at somewhat higher cost, cloth that has been "volanized," a finishing treatment which results in better retention of electrical and mechanical strength on exposure to moisture.

But possibly the biggest step forward has been the provision within the past twelve months of glass fibre rovings and "chopped strand mat." The adequate supply of rovings, which are bundles of glass fibre yarns, has opened up the vast field of "preforming" which will be discussed later. Chopped strand mat is to some extent a cheaper alternative to woven cloth. It is usually supplied in rolls up to 36 in. wide and consists of randomly oriented short lengths of chopped fibres held together by a binder. At least three grades differing in weight and thickness are at present available. There are also other less widely used types of mat, such as those having directional properties.

The advent of loose fibres in form of rovings or mat is radically altering the economic basis of glass fibre reinforced plastics. As against 10s. to 15s. per lb. of woven cloth, the

* Microcell Limited.



Figs. 1—3.—Matched die moulding: Glass rovings entering the preform machine; removing preform from machine; fitting preform into the mould.

fabricator can now think in terms of 5s. to 6s. per lb. of basic fibre and there is every reason to anticipate a consistent lowering of this price as demand and production increases. It is interesting to realize that a laminate made of polyester resin and chopped strand mat, which can now be mass produced at an overall cost of about a third of that two years ago, is equal or superior, at least in its mechanical properties, to the best that could have been made then. Moreover, only few laminates made at that time from woven cloth by the hand lay-up method could have claimed to attain tensile strength above 25,000 p.s.i. or Young's Modulus in excess of 1.5×10^6 p.s.i. But such figures are now being obtained consistently in mass produced chopped fibre mouldings.

Further improvements can be confidently expected, especially with regard to versatility and improved quality of glass fibre materials. Serious attempts are being made to develop alternative binders and sizes for both filament and mat. Mats and rovings having a " volan " finish may become available and other alternative finishes for both mat and cloth are no doubt under active development. Amongst woven cloth the trend is towards the wider use of " satins " and more open weave cloths and attempts are also being made to produce unidirectional cloth from rovings. Future progress in the field of basic glass filaments is most likely to be towards heavier weight sliver and this it is hoped will result in reduced cost.

Resins

Turning now to the resin position, a definite change within recent months can also be recorded. Some one and a half or two years ago there were only two manufacturers in this country marketing a range of three to four polyester resins suitable for use with glass fibres. They were good products and performed their function well. But at 6s. to 7s. per lb., they were rather expensive and the limited range did not quite cater for the many special properties required. The picture today is quite different. The available polyester resins are too many to enumerate and almost every month sees a new supplier entering the field or a new type being added to a manufacturer's range. There are grades specially formulated for certain manufacturing techniques, such as hot curing matched die moulding. Others are specially designed for

Fig. 4 (Below) Matched die moulding: removing finished moulding from the press.

Fig. 5 (Right) Testing corrugated roofing sheet to Building Research Station specifications.

Fig. 6 (Below, right) A group of glass reinforced mouldings, showing the variety of shapes which can be produced.

extreme clarity and others again have exceptional heat resistance and are said to withstand exposure to 200° C. for several days without undue loss in strength. There are also several newcomers among the standard types of hot or cold setting polyester laminating resins and some companies market both a rigid resin and a resin giving tough flexible products.

Naturally enough, this state of great activity has been reflected in the prevailing price trends and today many grades of polyester resins are available in bulk at prices around 4s. 3d. per lb. Although it is rather problematical if a further drastic drop in this price can be expected, one may still hope for some improvement as demand increases. But the main line of future progress in the polyester field may well lie in still closer attention to the properties of the resin as required for the several techniques and the many specialized applications.

Resins other than polyesters have also been used in conjunction with glass fibres. For example some types of conventional phenolic and melamine laminating resins, silicone resins and more recently the epoxide resins, have all been employed in the preparation of glass cloth laminates. Although these have found only limited commercial applications, mainly in the electrical industry, the phenolics in particular are potentially important because of their inherently lower cost. The silicones on the other hand, are potentially of great interest because of their exceptionally high heat resistance, but as they are inherently very high priced materials, it is doubtful if they will serve other than small specialized outlets.

Production Methods

While the resin position has been improving and the new forms of glass fibres have become available, there has also emerged a different production technique which is becoming the basis of the economic large scale production of glass reinforced polyester resin articles. In the past fabricators thought in terms of hand lay-up or vacuum impregnation followed by curing at room temperatures using a rubber bag or male and female moulds made of wood or plaster. This technique has the advantage of being relatively simple, the moulds being easily manufactured and a vacuum pump or rubber bag often being the most expensive item of equipment needed. On the other hand the moulds may be suitable for short runs only, the wastage of materials is very high and it is difficult to ensure consistent quality. Such properties as thickness, density and surface finish are not easy to reproduce.

The alternative process consists of preparing a preform of the desired shape from chopped rovings, followed by hot curing between matched metal dies in a press, after the resin has been poured on.* Figs. 1-4 illustrate some stages in the process as carried out in the works of Microcell, Ltd. The capital investment involved is, of course, considerable. The special preforming machine which cuts the rovings and deposits the chopped fibres on the former and the special high-daylight, low-pressure presses which are required for the moulding operation, are both expensive items. For each job the cost of the metal dies must then be added. Moreover, the production schedule is reduced to a few minutes, each moulding is perfectly uniform and of consistent quality and the strength characteristics are equal or better than those of similar articles made by the lay-up technique. But the process does require much stricter control of raw materials and close checks at every stage of the operations.

The rapid development of the matched die moulding technique is gaining considerably from the availability for the last few months of one preforming machine made in this country. Quite recently two U.K. manufacturers have brought on the market presses specially designed for low-pressure glass fibre moulding and other specialized equipment such as glass fibre cutters has become available here. Thus a moulder specializing in glass fibre work has now at hand a technique eminently suitable for the economic mass production of a very wide range of articles. But this does not mean that the older methods have lost their usefulness. For prototype work, for short production runs, for particularly complicated shapes or for extra large structures such as boat hulls and radomes, hand lay-up or vacuum impregnation probably still remains the more economical method. But with further progress in the development of suitable presses and preforming machines and of properly balanced and formulated resins, the production of even bigger structures and more complex shapes by matched die moulding may finally prove the most economical.

There are numerous examples of articles the mass production of which would have been impracticable or uneconomical one or two years ago, but which today are a sound commercial proposition. There is for instance the production of corrugated glass fibre roof lighting made from chopped strand mat and special resins formulated to give sheets of high light transmission; Fig. 5 shows a corrugated sheet under test. Similarly the production of small boats, special car bodies (see Fig. 7) and other large structures made from chopped strand mat is now possible and economically sound. Other articles, such as those illustrated in Figs. 6 and 8, include covers and housings, trays, boxes, suitcases, panels and many others, all of which can now be mass produced at competitive prices. Thus the glass fibre reinforced plastics industry has reached a stage when it can look forward confidently to a rapidly expanding market for its many varied products.

In conclusion the authors wish to express their thanks to the directors of Messrs. Microcell, Ltd., for permission to publish this article.

* This process has been described in some detail in *Plastics*, January, 1953, p. 3.

Fig. 7.—Part of car body in glass reinforced plastics.

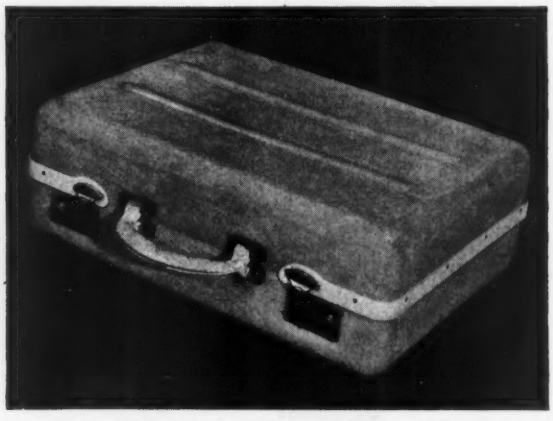
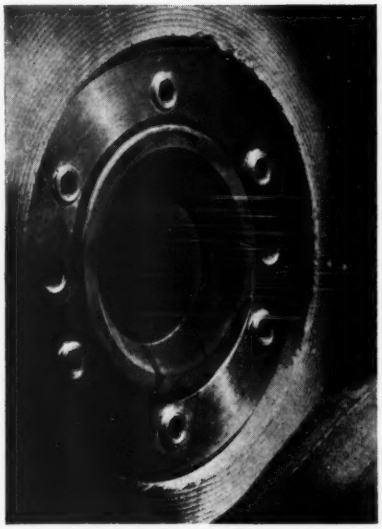


Fig. 8.—A suitcase in glass reinforced plastics.

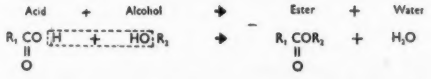


Polyesters—Some Notes on Their Basic Chemistry

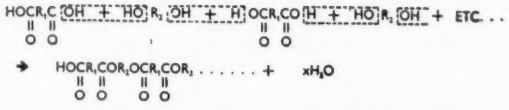
By J. RHYS, M.Sc.

The preceding article on pages 202—204 *deals with some of the economic considerations involved in applying reinforced plastics. To amplify this, the following article explains the fundamental chemistry of polyester resins, now much to the fore in experimental and production work. The history of polyester resins is briefly traced and the present applications touched upon. The photograph shows a stage in the production of a polyester fibre.*

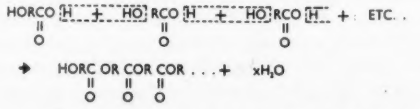
ALTHOUGH "polyester" is a relatively new name in the industry, the substances themselves are by no means new. In organic chemistry there is an elementary reaction: acid plus alcohol yields ester plus water.



If the acid is dibasic, that is contains two COOH groups, and the alcohol is dihydric, that is contains two OH groups, the resulting product may be a linear polymer.



If an organic compound containing both an acid group and an alcohol group is allowed to react with itself, the resulting product may also be a linear polymer. By variations on this

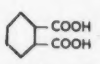


basic reaction we can produce a number of these polyesters and so obtain a number of important classes of plastic materials, viz.:—

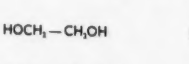
1. Surface coating agents.
2. Moulding powders.
3. Synthetic fibres and rubbers.
4. Plasticizers.
5. Contact laminates.

1. Surface Coating Agents

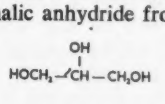
The polyesters used in this field are the well-known alkyd resins. These are sometimes called glyptals, but this term is proprietary to certain resins of the General Electric Company of America. The industry first became interested in them in 1912-1914, but it was not till after the first World War that any significant developments occurred. This was due to a cheap process for the production of phthalic anhydride from



Phthalic acid



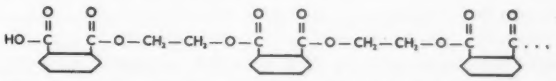
Ethylene glycol



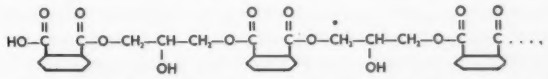
Glycerol

naphthalene by vapour phase oxidation. The following were the early raw materials for alkyd formation:

When phthalic acid and ethylene glycol are reacted together the result is a thermoplastic resin.

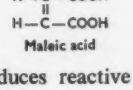


With glycerol the linear polymer first produced can react with more acid via the third OH group. This produces a thermoset, cross-linked compound.

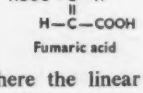


The thermoplastic alkyds are used as plasticizers in lacquers and with etherified "urea" finishes. As well as acting as plasticizers they protect the pigment from fading due to exposure to ultra-violet light. The thermosetting alkyds are used as finishes, moulding and allied types of compositions. The physical properties of each product will depend on the nature of the linear polymer, that is, on the structure of the reactants, the position and frequency of reactive groups, and on the presence of side chains. They have film-forming properties and so are much used in the surface-coating industry. In fact, during the past few decades they have been used to greater and greater extents, and their impact on the paint industry has been considerable.

The alkyds used in these industries are not straight alkyds but have been modified to give desired products. If part of the above reactants are replaced by a monofunctional reactant, that is one containing only one OH or COOH group, it will stop polymerization at desired limits and so modify the solubility, flexibility, etc. If this component is unsaturated or has drying properties, then these are kept in the alkyd. (Drying means the capacity of gelation and film formation by the absorption of atmospheric oxygen.) These drying oil modified alkyds give finishes of greater durability and shorter drying time than did the conventional varnishes and lacquers. Stoving lacquers can be made by replacing part of the phthalic acid by maleic acid or fumaric acid.



Maleic acid



Fumaric acid

This introduces reactive points where the linear polyesters can cross-link to give insoluble, infusible products.

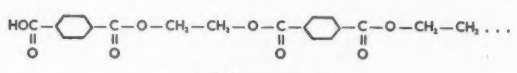
2. Moulding Materials

Straight alkyds of the glycerol phthalic acid type give very pale, hard resins which would appear to be ideal as a base for moulding powders. However, two factors make them useless. Compared with phenolics and ureas, the rate of cure was very, very slow, and also this slow rate of cure was accompanied by the slow evolution of water. The first attempt to cure this was to speed up the rate of cure by adding catalysts. (Catalysts are chemical substances added to a reaction in order to speed it up.) The second attempt, by modifying the resin itself, was much more successful. By substituting the phthalic acid by unsaturated substances such as maleic and fumaric acids, unsaturation was introduced into the polymer chain. This allowed a much more rapid rate of cure, and since this time the cross-linkage was a polymerization and not a polycondensation, no water was evolved during the final cure. In fact, the material has become so fast curing that special fast-closing presses are required. The press should close in four to six seconds after charging the mould. Lower temperatures can be used to compensate for a slower-closing press, but this will increase the tendency for the piece to stick in the mould. Using mica as a filler gives a moulding powder which finds its main use in electrical insulating parts, especially when good arc resistance, dielectric strength and resistivity is needed combined with excellent dimensional stability. Alkyds are superior to both shellac and phenolics in their adhesion to mica. With chopped glass fibre as the filler, a composition is obtained which can be moulded either by compression or transfer to give mouldings which have excellent dimensional stability combined with good electrical properties, a high heat-distortion point and outstanding impact strength. When moulding alkyd compounds in moulds which have been used for phenolics the mould must be thoroughly cleaned of all residual phenolic material. This is best done by moulding a urea formaldehyde compound prior to using the alkyd powder. For the first few mouldings liberal applications of mould lubricant (zinc stearate is one of the best) is essential.

Another method of modifying the alkyd resin was to form interpolymers between the unsaturated polyester just described and vinyl monomers such as styrene, vinyl acetate and allyl esters. In this case both the polyester and the vinyl compound possess unsaturation. Hence a highly cross-linked structure can be formed quickly at high temperatures, or more slowly at lower temperatures. These will be considered more fully in the section on contact laminates.

3. Synthetic Fibres and Rubbers

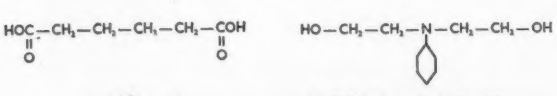
The polyesters investigated by Carothers in his classic research were aliphatic and had too low melting points to be of use as fibres. In 1946 the condensation product of terephthalic acid and ethylene glycol was found to have a melting point of 245° C. and to be capable of melt spinning to give filaments. When these were cold drawn to four to six times their length strong fibres were formed. This fibre has



Terylene molecule

good strength, elasticity, resistance to moulds and a low moisture uptake. The material has been developed by I.C.I. under the name of Terylene and looks to be taking a place alongside nylon in the synthetic fabrics.

Rubber-like products can be made either by selecting the



Adipic acid

N di (β hydroxyl ethyl) aniline

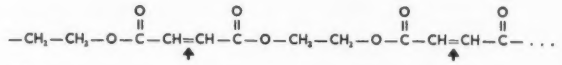
correct acid and alcohol, for example, or by modifying the polyester with a third component. I.C.I. Vulcaprene A, a synthetic rubber, which is used, amongst other things, for making an artificial leather, is prepared from monoethanolamine, ethylene glycol and adipic acid.

4. Plasticizers

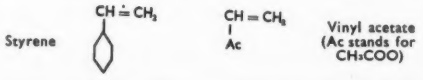
In the polyester type of plasticizer it is possible to combine the desirable properties of both polymeric and monomeric types of plasticizers. The polymer types are marked for their non-migrating characteristics and their oil and water resistance. The monomeric esters have low viscosities and high plasticizing efficiency. The low molecular weight polyester plasticizers are of special value in p.v.c. compounding when permanence and oil and heat resistance are required. They usually contain a long-chain aliphatic acid such as sebacic acid, and this allows them to retain flexibility at low temperatures. This makes them valuable compounding ingredients for ethyl cellulose and for chlorinated and synthetic rubbers.

5. Contact and Low-pressure Laminates

Reference to the structure of the polyesters used for this application has been made in the section on moulding powders. A polyester is built up from an alcohol such as ethylene glycol and an unsaturated acid such as maleic acid. The resulting molecule will have reactive points along the chain, as indicated by the arrows.



During the formation of the polyester, water is formed and is removed. The next stage is to cross-link the polyester. This can be done by the application of heat in the presence of a catalyst, but is much more easily performed by reacting with a vinyl monomer such as styrene or vinyl acetate.



In this operation no water or other unwanted by-product is produced, hence the laminate may be prepared at low or contact pressure. Frequently the curing can be done at room, or some not too elevated, temperature. The resulting resin can have properties varying from a hard brittle resin to a rubbery-like material. These variations are effected by altering the nature of the acid or alcohol used to prepare the polyester.

Bearing in mind the low temperature at which the cure takes place, it is obvious that the component parts must be kept separate until just before use. The main parts are:—

A. The chain of repeating ester units with reactive points at selected intervals along the chain.

B. The cross-linking agent, a liquid vinyl monomer.

In addition we have:—

C. A catalyst which effects the reaction between *A* and *B*.

D. An accelerator which speeds up the action of the catalyst.

These four components are supplied by the manufacturer either separately or combined in such a way that no reactive components are mixed together. If they are supplied separately *A* and *C* will first be mixed by the user. To this *B* will be next added, followed by *D*, if this is required. (*D* will be required for a room temperature cure, but not for a hot-press cure.) The result will be a viscous liquid. Alternatively, the maker may supply *A* and *B* already mixed. In this case the user will add *C* and *D* as required. Because

A Plastics Glider Wing and Radar Scanner Aerial

Notes on Two of the Largest Moulded Structures Ever Produced

Continuing the theme of reinforced plastics, this article deals with two specialized applications. The first is the glider wing (seen left), of resin bonded asbestos; here is described briefly the production sequence, illustrated with photographs. The second is the plastics aerial. Both are the work of F. G. Miles, Ltd., and amply demonstrate the versatility of reinforced plastics materials under stresses and tolerances normally only encountered by metals and metal alloys.

THE use of plastics in aircraft construction is gaining ground. Notes in previous issues of *Plastics* have made mention of the use of Redux adhesives in the Comet and of the research carried out at the Royal Aircraft Establishment, Farnborough, which resulted in the delta wing, a phenolic-asbestos laminate. We were therefore very interested to visit recently the plastics division of F. G. Miles, Ltd., at Redhill Aerodrome to see the unveiling of a glider wing of 30-ft. span, and to study the production programme whilst in operation.

The excellent mechanical properties of phenolic-asbestos laminates need hardly be mentioned here. Their application to wing structures is, however, fascinating and one cannot fail to be impressed by the engineering achievements which have resulted in the formulation of a satisfactory technique and the construction of the ancillary tools and equipment.

Each wing, two of which form the complete glider span, constitutes the largest one-piece moulded phenolic-asbestos structure ever manufactured. As the first step towards production a mould of the wing having exactly the same outside shape as the flying wing is made up of concrete, steel and phenolic-asbestos material. On to this is placed a layer of soft phenolic-asbestos material which is made rigid by heat cure. This is called the master liner and cure is carried out by thermocouples and electric blankets.

A further layer of phenolic-asbestos material is then placed on this and again heat cured. The shell thus produced is the heart of the main mould, which is supported in place and covered with concrete.

To make the wing proper, soft felts of the phenolic-asbestos material are cut to shape and placed in position on the loading table together with honeycomb material. This, made of paper, is painted with furane to avoid degradation due to vapour produced during the heat treatment of the felts. The outside felts are then laid in place and the table is lowered over a loading trolley. The loading trolley and soft felts are then inserted in the mould, the trolley moving in on railway lines. A rubber bag is used to seal the felts and suction is applied.

By means of an elaborate electrical unit the wing skin is cured after about six hours. It is then removed from the mould and after trimming is ready for the fitment of the ribs and trailing-edge closing member.

These wings form part of the high-performance two-seater glider under construction by the British Gliding Association. It is a notable achievement and one which reflects credit upon the plastics industry and upon the engineers and chemists who have been responsible for its success, in that a synthetic resin has again stood comparison with alloys.

In addition to the work carried out on glider wings, F. G. Miles, Ltd., have for some time now been in production of plastics aerials for A. C. Cossor, Ltd. The following notes on these important structures will be of great interest.

In view of the high wind loads imposed on large aerials mounted on the top of a tower, it was evident that a firm with considerable experience in aero-dynamics could best carry out this work. Such aerials must be able to rotate continuously in a 70-knot wind with an infinitesimal amount of deflection and must be able to withstand gusts of 110 knots. The first successful aerial was for harbour control purposes and was demonstrated in operation throughout the Festival of Britain Exhibition on the South Bank site. An improved model of this type has since been put into production. More recently a second type has been developed which incorporates a paraboloidal aerial 14 ft. in diameter moulded in one piece.

The mould upon which these aerials are constructed is built up in reinforced concrete shaped roughly to the paraboloidal profile. The top surface of the mould is then covered with phenolic-asbestos material which is subsequently machined accurately to the desired shape. Into this top surface are embedded resistance heater mats and a series of thermocouples laid in a glass fibre blanket. There are some 400 of the thermocouples which are connected through an automatic telephone relay system to a Cambridge Recorder.

The aerials are built up as a sandwich with the outer layers

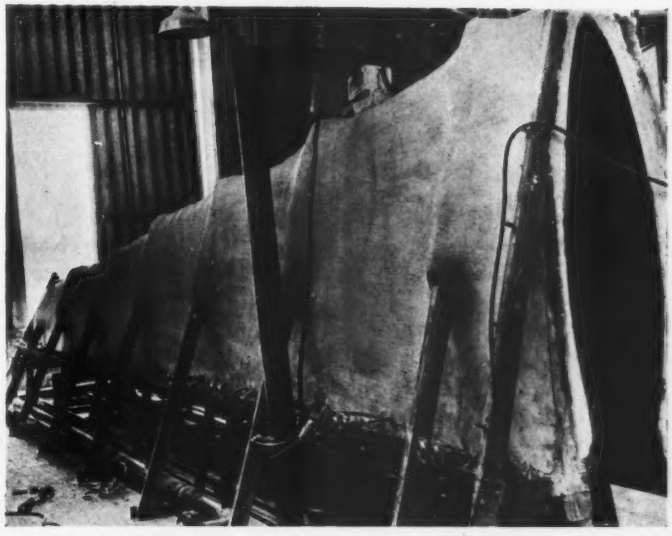
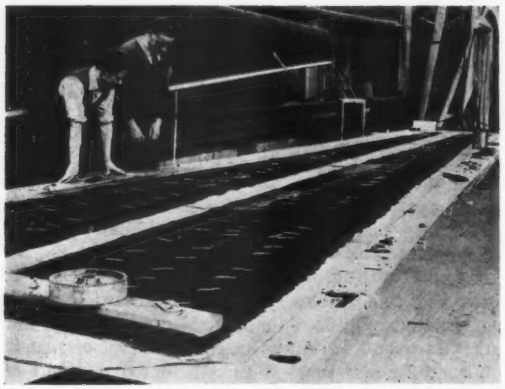


Fig. 1.—Main mould incorporating heating elements.

of phenolic/asbestos enclosing a resin impregnated core of paper honeycomb. In this way it is possible to produce a scanner aerial as strong as, and stiffer than, an aluminium alloy aerial of the same profile which would weigh more than twice as much as the plastics aerial. The manufacturing technique is broadly as follows:—

As the phenolic/asbestos felts forming the face of the aerial to be moulded are laid on top of the mould, the meat in the sandwich, the strengthened paper honeycomb, is then laid with further phenolic/asbestos felts on top. Over the top of the thus formed sandwich are placed another set of resistance heater mats enclosed in fibre glass together with a further thermocouple blanket. The entire mould is then enclosed in a rubber vacuum bag from which air is evacuated, thereby removing moisture from the sandwich as it cures, and supplying an even pressure over the surface of the mould. Electric power is supplied to the heat elements by means of a 200 h.p. motor, driving a variable voltage generator. The same motor drives various vacuum pumps through a gearbox. Owing to the extended running periods, the vacuum pumps are fitted with an auxiliary water cooling system.

After curing is completed the aerial is removed from the mould to which it has been prevented from sticking by means of a suitable parting medium, and is then mounted on a special rig for contour checking. The aerial is then fitted with metal brackets at positions previously reinforced and the face is sprayed with metal to form the desired reflecting surface. After polishing and finishing the aerial is then ready for mounting on its supporting structure.

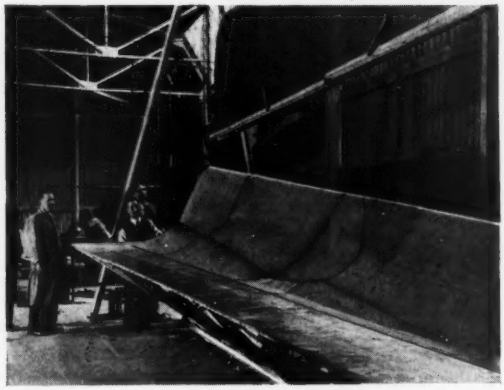


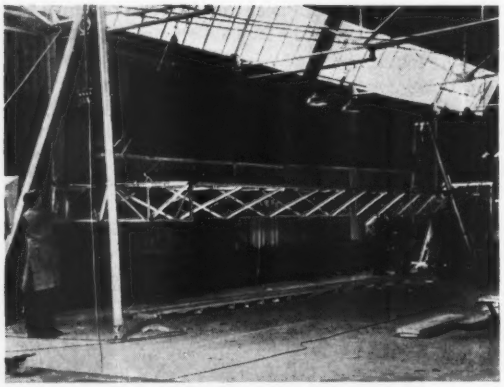
Left: Fig. 1

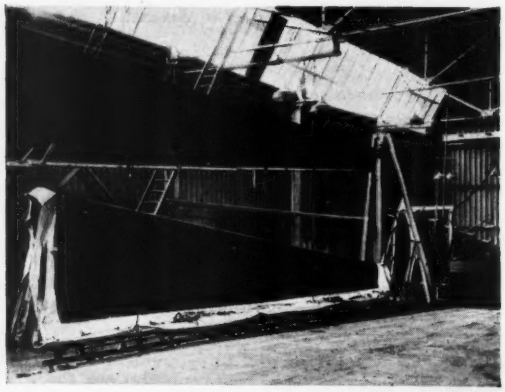
Right: Fig. 2

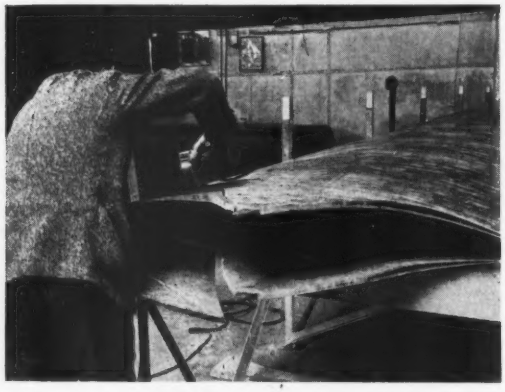
Below left: Fig. 3

Below right: Fig. 4









Left: Fig. 5

Right: Fig. 6

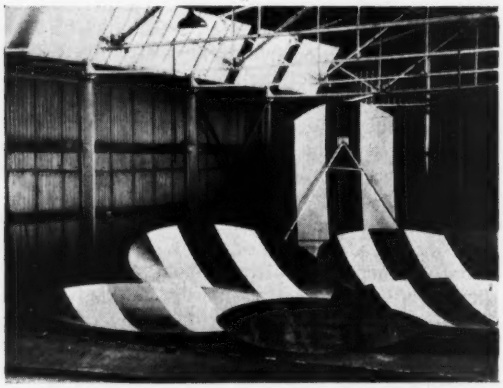


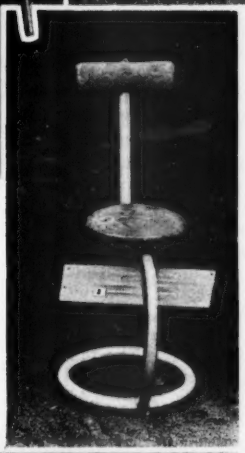
Fig. 1: Laying up the resin impregnated asbestos felts; the felts are "tailored" to the wing outline. Fig. 2: Moving the assembly over to the entrance to the main mould. Fig. 3: Hoisting the assembly clear of the lay-up table. Fig. 4: Lowering the outer skin of felts onto the inner liner, preparatory to moving the whole assembly into the main mould seen to the right of the picture. Fig. 5: Finishing the wing structure, on removal from the mould. Fig. 6: Radar scanner aerials in a corner of the F. G. Miles Ltd.'s works.

Plastics in the Park

(Above) Single chair with glass fibre laminate seat and back; the pattern is obtained by incorporating printed rayon in the laminate surface; labels can be similarly incorporated. Designed by Gordon Burley, manufactured by F. Lewis and Sons, Birmingham, 6. Prototype seat and back panels fabricated by British Industrial Plastics, Ltd. (2nd class diploma).

(Above, centre) Chair with moulded glass mat laminate seat available in opaque and translucent colours; heraldic designs incorporated if required. Designed by A. C. Parnell and R. G. Robbie, manufactured by Design Workshops Ltd., London, W.1

(Above) Single chair with seat and back moulded from woven glass cloth laminate. The decorative surface is obtained by use of printed fabric in the top layer. Designed by Innes Read and Peter Williams, manufactured by Andrew A. Pegram, Ltd.

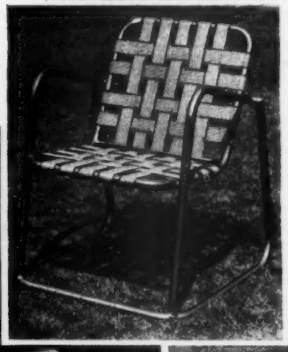


(Right) Stool with seat and backrest covered with Florestin weather-resisting p.v.c. upholstery material. Designed by J. Laskey, manufactured by Barnards, Ltd., Norwich.

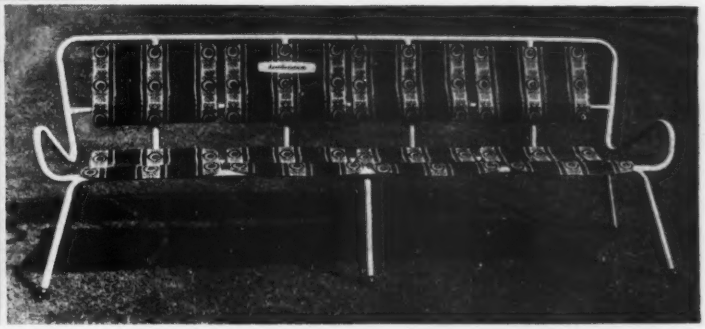
GLASS reinforced plastics laminates and other plastics materials were used by some of the manufacturers who submitted entries to a recent competition for new designs of seats for use out of doors. Nearly eighty seats and benches of all types, entered for the competition organized by the Council of Industrial Design and the Corporation of Birmingham, were exhibited in Victoria Embankment Gardens, Westminster. There were no prizes but a number of 1st class and 2nd class diplomas were awarded.

It was encouraging to see one 1st class award and three 2nd class awards among the seats using plastics in various forms. Designers have handled the new materials with skill and imagination, particularly in using new ways of introducing colour and patterns into the design.

Further details, including prices, of these seats may be obtained from the Council of Industrial Design, Tilbury House, Petty France, S.W.1.



(Right) Nesting armchair with Tygan (woven vinyl monofilament) webbing for seat and back. Designed by R. A. Woodhouse, manufactured by Pel, Ltd., Oldbury, Birmingham. ; (2nd class diploma.)



(Below, left) Chair with pigmented polyester glass fibre laminate seat riveted on to lugs of steel frame. Designed by John D. Vale, manufactured by F. Lewis and Sons, Birmingham, 6 (1st class diploma). (Below, right) Four-seat bench by the same manufacturer, with glass fibre seat and back panels incorporating printed rayon in the surface of the laminate. Designed by Gordon Burley; (2nd class diploma). All prototype panels fabricated by British Industrial Plastics, Ltd.

British Industries Fair

Some new machines and ancillary equipment for the plastics industry, new plastics materials and applications of plastics in industrial and consumer products are described in the following summaries.

NEW MACHINES

Bipel Automatic Control Low-pressure Press

This press has been designed specifically to meet the requirements of fabricators in reinforced plastics materials such as polyester glass fibre laminates. Due to the low pressure required for this type of work, a large platen area (4 ft. square), long stroke and daylight can be achieved with a maximum pressure of 150 tons. The press is of all welded construction; it has a 4 h.p. built-in power unit. Daylight is available from 30 in. to 72 in. and the stroke from 6 in. to 42 in. For easy load and lay up work a hydraulic slide-out bottom table is incorporated. A safety device prevents this table from sliding out unless the lift-type guard is fully open. In operation the press has three closing speeds, two of which have a variable stroke and speed and a high mould parting force of over 30 tons, with 3 in. per sec. rising speed. The automatic cylinder is operated by closing the guard.

Bipel Fully-automatic 60-ton Compression Press

Built as a special purpose press for the fully-automatic production of small mouldings and long runs, this press incorporates all the structural features of the standard Bipel auto-control machine. Positive hydraulic ejection is incorporated and limit switches prevent damage due to faulty moulding conditions. A simple and effective feeding arrangement gives an opened press time of only 10 sec. The feeding device can easily be stripped to convert the press to standard working.

Bipel Self-Contained Horizontal Pelleting Machines

Three variations of this machine are now available. The 35-ton unit exhibited last year can now be fitted with double punches to increase output in the smaller sizes. A 12-ton unit built on the same lines can produce pellets up to $1\frac{1}{2}$-in. diameter at a rate of 2,220 per hour. The 70-ton unit also has the same basic design but will produce pellets up to $4\frac{1}{2}$-in. diameter at a rate of 840 per hour. Dependent on the density of the material, pellets up to 20 oz. are produced giving maximum output at the rate of 1,000 lb. per hour.

(B.I.P. Engineering, Ltd., Streetly, Staffs.)

Fully-automatic Injection Machine

Built as a 1-oz. machine, the S.H.1 can be adapted to 2-oz. capacity at 13,000 p.s.i. The plasticizing capacity is 22-24 lb. per hour with maximum of 480 shots an hour. Under tests on an actual moulding operation six full-weight shots per minute were obtained. The machine has a direct hydraulic lock of 20,000 p.s.i., injection being interlocked with the clamp so that it cannot operate until the machine is locked. The injection assembly based on Windsor's retraction unit system gives easy access to the sprue bush and material cylinder. The retraction unit can be used to give sprue break at every shot. Hydraulic power is supplied by a Vickers V-139-U-F-S7 double pump driven by a $7\frac{1}{2}$-h.p. motor. (R. H. Windsor, Ltd., Chessington, Surrey.)

The Twin-o-matic and triple Twin-o-matic presses shown by Jackson Heywood, Ltd.

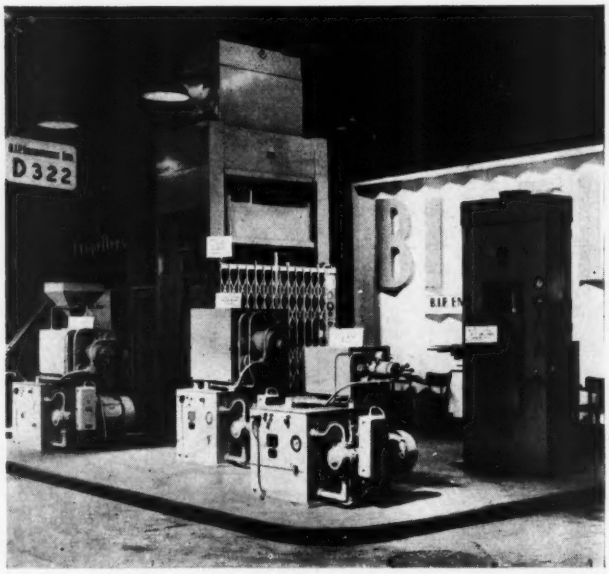
Multi Ram Hydraulic Press

The use of an all-welded steel construction not only speeds delivery times of these presses but makes it a comparatively simple matter to incorporate special features to customer's requirements. The machine shown at Castle Bromwich was a half-scale model working at 70-ton pressure, using eight rams to equalize pressure over the whole platen area. The pump unit is a Fraser two-stage pump.

Hydraulic Loading Tables

A loading table for use with hydraulic presses can work from the same hydraulic system as the press which it serves. An alternative self-contained unit will serve a number of presses and is particularly useful for transporting moulds. This unit is hand-operated or can be fitted with a pump.

(Hodson and Co. (Machinery), Ltd., Toddington, Nr. Bury, Lancashire.)



(Above) B.I.P. stand with low pressure press, automatic 60-ton press and pelleting machines. (Left) Hodson multi-ram press.

Kopp infinitely variable gears

These units have proved extremely useful in regulating the operation of thermoplastic extrusion machines and take-off equipment. One large company of trade extruders is using 48 units.

(Allspeeds, Ltd., Accrington, Lancs.)

Infra-red radiant units

The Bratt Colbran industrial gas-operated radiant units are designed to be built up in groups to form ovens or tunnels for rapid drying, stoving and finishing operations. The ease of installation makes this type of oven particularly flexible so that it can be adapted for different requirements. Examples of uses include heating and thermoplastic sheets prior to forming and preheating or curing of moulding materials or mouldings.

(Bratt Colbran, Ltd., London, W.1.)

Constant rate feed weighing scale

A new electronic scale designed to supply a constant flow of material was seen in operation weighing out p.v.c. chips. It is designed particularly for non-stop mixing and blending of granular type materials fed into the machine by gravity or alternatively by a screw conveyor. A blanket of material is supplied to the moving belt and balanced against a weight box. If alteration in the feed occurs an electronic switch alters feed to correct the error. By changing the speed of the moving belt and by altering the balance weights, a wide range in lb. per hour can be covered. Three different sizes of machine are available.

(W. and T. Avery Ltd., Birmingham, 40.)

Interlocking press guard

An improved type of interlocking guard for hydraulic presses incorporates many new features contained in recommendations about to be published by H.M. Factory Department. One feature is an intensified brake fitted in conjunction with the guard which allows the guard to open half-stroke on the press. In the event of an uncovenanted stroke occurring the arrester brake stops the press under power and cuts out the motor.

(Press Guards Ltd., Hockley, B'ham.)

Improved pump unit for hydraulic presses

The improved Finney-type pump unit was shown for the first time at Castle Bromwich, where it was operating two 80-ton Finney transfer presses, although in a production set-up a much larger number of presses would be served by one unit. The pump incorporates the main feature of the earlier totally oil-immersed unit, but it now acts as a dry pump, being mounted above the reservoir. Capacity of the unit is 3 gallons per minute up to 7,000 p.s.i. and 28 gallons per minute up to 200 p.s.i. The pump may be operated in conjunction with the Greer-type pneumatic accumulators made by the same company.

(Finney Presses, Ltd., Birmingham, 1.)

Thermindex temperature indicator paints

These paints which change colour sharply at indicated temperatures from 80° C. to 800° C. are suitable for indicating variations of temperature particularly over large areas and in inaccessible places. Most of the paints change colour more than once, in some cases four or five times.

(J. M. Steel and Co. Ltd., London.)

Electrode water boilers

Displayed as representative of the range of Autolec electrode steam raisers and water boilers were an 800-kW. heater and a 15-kW. heater, probably the smallest of this type ever produced in this country. It should interest users requiring small intermittent supplies of heated water for space and process heating.

(G.W.B. Electric Furnaces Ltd., Dudley, Worcs.)

Metal detectors

In the plastics industry use of metal detectors can prevent costly damage to calenders, embossing rollers, etc., particularly in processing vinyl compounds. The latest development is a control unit operating four separate detector heads.

(Loma Electronic Equipment Ltd., London, S.E.1.)

Spraying equipment

Industrial and artists' spraying equipment for a variety of purposes include a special type for spray application of acid-base fluids such as ferric chloride.

(Colour Sprays, Ltd., London, N.W.3.)

Drills and cutting tools

Prolite tools of particular interest to the plastics industry include hard metal burs and solid hard-metal twist drills. Solid tungsten carbide drills have outstanding life when used for thermosetting mouldings and laminates.

(Protolite, Ltd., London, W.C.1.)

NEW MATERIALS

Putty-like vinyl compounds. Vinagels are putty-like compounds based on p.v.c. with remarkable thixotropic properties. They can be hand formed or pressed into moulds and removed without distortion; they can be extruded or embossed cold with little pressure. V.G. 116 results in a flexible object after curing, whilst V.G. 118 becomes much harder. Suggested uses are for permanent flexible moulds, prototypes and models, gaskets and packings. A similar but semi-liquid compound is suitable for the dipping process; much thicker, even coatings being obtainable in a single operation. (Vinatex, Ltd., Carshalton, Surrey.)

Thermoplastic resins for glass fibre treatment. Resin E.C. and Resin P.A. have been developed as bonding agents for glass fibres, having good wetting properties for glass. They are suggested as intermediate bonding agents between glass fibres and other plastic or metal surfaces. P.A. is a polyamide melting at 110-120° C. (Watford Chemical Co., Ltd., London, E.3.)

Ion exchange resins. Recent developments have extended the scope of ion exchange resin applications from water treatment to a variety of chemical processes; resins are usually based on polystyrene. A new portable water treatment unit also makes extensive use of plastics components in the construction of the equipment. (Permutit Co., Ltd., London, W.4.)

Press polished transparent p.v.c. sheet. Largest single outlet recently has been for packing souvenir sets of new coins; other applications shown were novelty purses, travelling cosmetics cases and self-adhesive display signs. **Polythene sheet, rod, tube and block.** Sheets from 1/16th-in. thick are available in sizes 36 in. by 36 in. and 84 in. by 36 in., rod from ⅛-in. diameter, block from 1-in. thick; also continuous welding rod. (Stanley Smith and Co., Isleworth, Middx.)

Paper laminate with high mechanical strength. Whereas paper laminates have excellent electrical properties, fabric base laminates have usually been chosen where high mechanical strength and machinability is required. A new grade of paper laminate is claimed to have the strength and ease of machining of the fabric without losing electrical values. For part of an oil duct a thread was cut on a paper tube. (Ferranti, Ltd., Hollinwood, Lancs.)

Darvic. I.C.I. rigid p.v.c. sheet has a new name and many new uses, including railway toilet compartment towel holder, cycle mudguards and fire hydrant indicator plate. Machined from a yellow and black sandwich laminate. (I.C.I. Plastics Division, Welwyn Garden City, Herts.)

Water-soluble resins. These materials vary from viscous light-coloured liquids to pale-brown solids and are completely soluble in water yet insoluble in most organic solvents. They are intended as plasticizers for casein and as water soluble lubricants. Other suggested uses are as mould lubricants for rubber, in textile treatments. (Watford Chemical Co., Ltd., London, E.3.)

Nylon. A great variety of weaving, knitting and spinning techniques has widened the types of material, both pure and mixed, which are available. Considerable technical progress has been made in the production of cotton-spun nylon staple for garments and for industrial purposes. Flax-spun nylon makes an attractive canvas for use in travel goods, golf bags, etc. (British Nylon Spinners, Ltd., Pontypool.)

Terylene. Now that development quantities of Terylene filament yarn and staple fibre are available, many outlets are being investigated and some of these were displayed. Industrial applications appear to be particularly promising for purposes such as ropes, sails, fishing nets, electrical insulating material, filter cloths, anode bags and fire hoses. The strength combined with low stretch makes the fibre suitable for industrial belting, and supporting slings for drop hammers are in use. (Imperial Chemical Industries, Ltd., London.)

Plastics/glass splinting material. Glassona bandages are made from a mixture of glass and cellulose acetate fibres knitted together into a stockinette type of material to form a bandage which, after being wetted by a special solvent to soften the acetate, is allowed to dry to a rigid cast. Being light and porous, the casts have advantages over plaster of paris. (T. J. Smith and Nephew, Ltd., Hull.)

Lampshade material. Rilfoil translucent semi-rigid p.v.c. 0.010-in. sheet can be used in the same way as cellulose acetate. It is available in various embossed patterns in pastel shades. (Rubber Improvements, Ltd., London, N.W.10.)

APPLICATIONS OF PLASTICS AT THE B.I.F.

Non-inflammable conveyor belting. After recent tests carried out by the National Coal Board, p.v.c. has been generally recommended as a surfacing and impregnating material for underground coal conveyors. Many companies were exhibiting this type of conveyor. (British Tyre and Rubber Co., Ltd., London, S.W.1; Dunlop Rubber Co., Ltd. (General Rubber Goods Division), Manchester; Gandy, Ltd., Wallasey, Cheshire; J. H. Fenner and Co., Ltd., Hull; Rubber Improvements, Ltd., N.W.10.)

Shell moulding. Resins and equipment for use with the resin-bonded sand shell method of producing metal castings probably aroused more interest than any other groups of exhibits. With its potentially vast consumption of synthetic resins this process has been vigorously taken up by all the large resin manufacturers and both Bakelite, Ltd., and I.C.I., Plastics Division, showed outstanding examples of both shell moulds and resin-bonded cores. Two fully automatic machines for producing shells were shown. The Polygram machine, described recently in *Plastics* is now available with automatic turn-over for the pattern investment box. A British-built version of the U.S. Sutter machine was seen in operation. This machine uses a single-pattern plate, and curing and preheating are carried out by a movable radiant unit fitting over the pattern. (Resins: British Industrial Plastics, Ltd.; British Resin Products, Ltd.; Bakelite, Ltd.; I.C.I., Ltd. Equipment: Polygram Casting Co., Ltd., London, W.4; Foundry Equipment Ltd., Leighton Buzzard.)

Fabrications for chemical plant. Ducts up to 3-ft. diameter can be welded from rigid p.v.c. and corrugated bends are employed for making curved pieces. An improved method of tank lining employs a sandwich laminate of plasticized p.v.c. between the metal tank and the rigid p.v.c. lining. (Prodorite, Ltd., Wednesbury, Staffs.)

Transmission belting combines plastics and leather. Miraclo belting combining a non-slip leather driving face bonded to a polyamide material is claimed to provide a light and supple belt of very great strength. Speeds up to 10,000 ft. per minute can be reached. Meteor plastic-and-chrome endless belt combines a load-bearing synthetic cord with a chrome leather driving face and a leather or fabric back. (Stephens Belting Co., Birmingham, 4.)

P.T.F.E. ring seals and packings. For specialized high-temperature applications or where complete chemical inertness is required, Fluon, I.C.I.'s polytetrafluoroethylene is employed. (James Walker and Co., Ltd., Birmingham, 16.)

Soap-cutting dies. The complete non-adherence of p.t.f.e. to other materials is utilized in the manufacture of soap dies, where previously used metal dies were liable to sticking and required frequent cleaning. This is one of the fabricating jobs carried out by Dunlop Rubber Co., Ltd. (General Rubber Goods Division).

Silicone elastomer mouldings and extrusions. Many applications are being found for this material in high-temperature work, specially in the electrical industry. Both normal- and high-tensile strength grades are processed by this company. (Northern Rubber Co., Ltd., Retford, Notts.)

Polythene tube for dyeing plant. An installation employing over 1,000 ft. of black polythene tubing, 2-in. and 6-in. diameter, was demonstrated at the exhibition by a scale model. The piping is used for conveying pure water where it is essential that no contamination should occur. **Rigid p.v.c. tube,** both plasticized and unplasticized is extruded up to a diameter of 3½ in.; polythene is available up to 12-in. diameter. (Tenaplas (Sales), Ltd., London, W.1.)

Polythene orthopædic supports. Vitrathene polythene sheet is moulded by Pryor and Howard, Ltd., to form tough, semi-rigid supports for orthopædic treatment. **Rigid and semi-rigid p.v.c.** Applications of these sheet materials include collars, garden labels, refrigerator panels, road signs and advertisements. (Stanley Smith and Co., Ltd.)

Mouldings and laminates. A variety of moulded components primarily for the electrical and engineering industries were shown in both thermosetting and thermoplastic materials. Synthetic resin-bonded paper tubes and bobbins and stampings and fabrications from laminated sheets were also displayed. (Crystalate, Ltd., Tonbridge, Kent; Mica Products, Ltd.; Ebonestos Industries, Ltd.)

Laminates for furniture. Increasing proportion of heavy-duty tubular-steel tables and chairs for canteens and restaurants use laminate seats as well as decorative laminate table tops. (Cox and Co. (Watford), Ltd., Watford, Herts.)

Mouldings for domestic electrical equipment. Extensive use of moulded plastics components is made in the Victor safety iron and in hair dryers and hedge trimmers. (Bylock Electric, Ltd:, Enfield, Middx.)

Instrument case for Everest Expedition.—This case, made from glass fibre/polyester resin with hinged lid, is used by Dr. Pugh, physiologist of the British Everest Expedition. (British Moulded Plastics, Ltd., Walthamstow.)

Belisha beacons. The blow-moulding technique by which the majority of polythene bottles are produced has been adapted to make unbreakable translucent crossing beacons from the same material. (Cascelloid, Ltd., Leicester.)

Decorative emblems and trade marks. A display directed particularly to refrigerator manufacturers showed recent examples of 3-D mouldings, transparent acrylic mouldings with lettering or design, moulded in and coloured from the back, to give a solid appearance through the clear, plastic front. **Nylon components for refrigerator doors.** Roller bolts and bearer plates moulded from nylon have better wearing properties than metal and also act as thermal insulators between door and frame. (Wilmot Breeden, Ltd., Birmingham.)

Nylon mugs for trawler crews. Breakages of crockery in heavy seas may mean days at sea without a hot drink. Scottish trawler crews welcome the completely unbreakable, tasteless nylon mugs with ½- and one-pint capacity. (British Ropes, Ltd., Leith.)

Durestos boats. Although English boat owners remain faithful to traditional wood, in tropical climates the dimensional stability, resistance to rot and pests make the reinforced plastics boats an outstanding success. (Southampton Launch and Boat Co., Ltd., Southampton.)

Bottles for yachtsmen. A set of Poly-tainer polythene jars and bottles, including a one-gallon water container should prove successful due to their light weight, unbreakability and resistance to sea-water corrosion.

Small switch for domestic use. The new Minimax electric switch is half the size of the normal domestic type. The housing, which is produced in cream urea and other colours, is suitable for adaptation for different fittings such as wall, ceiling, etc. (United Ebonite and Lorival, Ltd.)

Fountains. A number of plastics components are employed in fountains for indoor and garden use. Coloured plastics flowers are also supplied to make a set piece. (Stoke Fountains, Ltd., Godalming, Surrey.)

Stereoscopic viewer. A three-dimensional viewer for use with black-and-white or colour transparencies, is intended as a travelling sales aid where samples are unsuitable and photographs inadequate. The viewer is moulded in black phenolic material. (Ankersmit Photographic Industries, Ltd., Purley, Surrey.)

Hearing aids. Various small precision plastics mouldings for a new design of hearing aid were produced by Lacrinoid Products, Ltd. (Ardente Acoustic Laboratories, London, W.1.)

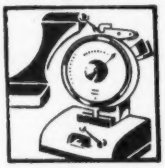
Spray bottles. Deodorants and antiseptic products are supplied in polythene containers. (New Hygiene, Ltd., London, N.7.)

Sanitary ware. Rigid p.v.c. flush pipes can be fitted instead of metal. Lavatory seats in black phenolic or in colours and new cisterns in bituminous material were also shown. (Shires and Co. (London), Ltd., Guiseley, Yorks.)

Hatpins and novelties. The Dragonfly hatpins have found a wide appeal in the export markets. (Chorley Floral Products, Uxbridge, Middx.)

World's Industry Employs Plastics

MATERIALS and TESTING



New foam plastics can be cast to any desired shape. They consist of phenolic and isocyanate resins combined with chemical agents. They eliminate many of the difficulties in handling pre-formed materials. (*Materials and Methods*, 1953/Feb./108.)

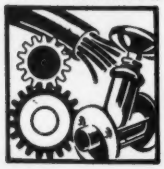
A rubber-base plastic has been suggested as a substitute for copper and its alloys in some applications such as pipes. Kralastic (United States Rubber Co., Rockefeller Centre, New York) is tough, corrosion resistant and of good dimensional stability. (*Machinery* (N.Y.), 1953/Mar./191.)

Asbestos-Neoprene, a soft material, is being produced by Victor Manufacturing and Gasket Co., Chicago, Ill., for light sealing pressures and medium-high temperatures. (*Mechanical Engineering*, 1953/Apr./319.)

Glass-reinforced plastics.—P. O'Keefe discusses in a comprehensive survey the low-pressure laminates. Information is given on: resins and reinforcements, moulding techniques, properties, part design and applications. (*Materials and Methods*, 1953/Feb./119.)

Plastic-elastic behaviour of high polymers.—F. H. Mueller, starting from the condition and the kinetics of high polymers, discusses the rheological behaviour as changes occur in the condition and in the kinetics due to mechanical stresses. Creeping and mechanical relaxation are shown to be co-ordinated mechanisms of entropy, which occur in a chainlike coupling of the individual cells. (*Schweizer Archiv f. angew. Wiss und Techn.*, 1953, Vol. 19, 78.)

INDUSTRIAL APPLICATIONS



Polyamide bearings in textile machinery. — The qualities which make nylon suitable are listed; information on operating loads and speeds, lubricants and coolants, is given. Nylon bearings can be used at temperatures exceeding 300° F., will carry a load of 550 lb. /sq. in. unlubricated, rising to 1,050 at 156 ft. per min. rubbing velocity when lubricated with water and to 1,550 at the same speed with oil lubrication. Rates of wear and coefficients of friction are given. Speeds of 13,000 r.p.m. for an unbalanced throwing spindle are quoted. (Question and Answer Service report, Office of Technical Services, Washington. T. I. D. U. Microfilm, I.R.7558.)

Polyester resins are increasingly used to speed up the impregnation of electrical windings in motor stators and rotors. The processing time is reduced from 70 to 4.5 hours. (*Product Engineering*, 1953/Mar./198.)

Laminated gears.—Basic data and details of applications. Problems of interference, backlash and conditioning are dealt with. (*Practical Engineering*, 1953/Apr./439.)

Laminated plastic vibrator block for textile looms has a non-woven random cotton-fibre mat filler. The life is expected to be 60 times that of wood vibrator blocks. (*Materials and Methods*, 1953/Mar./99.)

Plastic masses, probably silicones, are used in Russia as transmitting medium in clamping fixtures. E. G. Kopanevitch describes a number of interesting applications. (*Engineers' Digest*, 1953/Apr./129.)

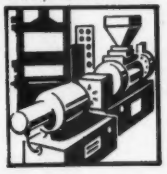
Butyrate fuse puller.—Four pieces of moulded cellulose acetate butyrate are hinged together in a toggle lever design. One end of the tool handles fuses up to 30A, the other up to 100A. (*Materials and Methods*, 1953/Feb./110.)

Thread inserts in laminated phenolics are made of stainless steel, solving several design problems at the same time. (*Materials and Methods*, 1953/Feb./112.)

The Reinforced Plastics Conference of the Society of Plastics Industry at Washington dealt largely with automotive and aircraft uses: helicopter research, high-temperature phenolics, glass fibre-polyester moulding materials, etc. (*Automotive Industries*, 1953/Apr./52.)

Transparent inspection models and templates of acrylic material are utilized by the Norton Co., for demonstrating the complicated drilling work on hydraulic parts of grinding machines. One panel requires 167 holes of ¼-in. to ⅞-in. diameter and up to 31 in. length. (*Materials and Methods*, 1953/Mar./99.)

PROCESSES : MACHINERY



Extrusion of rigid p.v.c. tubing. — Developments in production techniques, in particular with multiscrew extruders, and the problem of plasticizers are dealt with. (*Chemical Age*, 1953/Apr./515.)

Beryllium copper moulds are used extensively for the injection moulding of plastics and have effected important cost savings. Large moulds may be sand cast but pressure-cast moulds in the smaller sizes have advantages. The unusual metallurgical properties of beryllium copper necessitate controlled founding procedures. Moulds may be made also by the die-hobbing process. A brief bibliography is included. (T.I.D.U. Microfilm AFTR. No. 6222, Wright Patterson Air Force Base, Ohio. (PB106600), Nov., 1951).

COATINGS and ADHESIVES

Coloured Silicone finishes. — M. A. Glaser and E. Miller give a well-illustrated survey of the properties of coloured, heat-resistant silicone finishes, and compare them with alkyd-melamine base enamels. Recommendations for various classes of industrial equipment and consumer products. (*Product Engineering*, 1953/Mar./167.)

Phenolic resin coatings of thermosetting and cold-setting nature have been developed by Ric-wil Plastic Coating and Mfg. Corp., 1290 Euclid Avenue, Cleveland 15, Ohio. When the first is baked at 350 to 400° F., the coating hardens to form a chemically inert, insoluble, corrosion-resisting coating. The second material cures at room temperatures (60 to 80° F.) when a catalyst is added. The coatings are intended for the protection of ventilating and duct systems. (*Machinery* (N.Y.), 1953/Mar./190.)

Urea resins for the paper industry.—New raw materials have been created for producers of glues and adhesives by further development of water-soluble urea resins. They are used for labelling, etc., mixed with dextrin and animal glues. Applications and chemical properties are discussed. (*Kunststoffe*, 1953/Mar./103.)

MISCELLANEOUS USES

Plastic cams are a special feature of a new Swiss automatic sewing machine. The cams are exchangeable and control the operation of the machine to make different kinds of stitch. (*Product Engineering*, 1953/Mar./140.)

Injection mouldings and metal die-cast parts are combined in low-cost field glasses, thus reducing the amount of metal consumed. (*Materials and Methods*, 1953/Mar./98.)

New Productions

Miniature Greenhouse

A miniature greenhouse measuring $7\frac{7}{8}$ in. by $5\frac{1}{4}$ in. by $5\frac{3}{8}$ in. high has been introduced by Vlierden and Co., Ltd., 77 Leadenhall Street, London, E.C.3. It is moulded entirely of polystyrene in three parts—a green base tray which may hold small flower pots or may be filled with soil for direct planting, a clear transparent cover and a hinged adjustable window for ventilation. The cover fits accurately over the base and can be lifted off for watering the plants. The moulders were Punfield and Barstow (Mouldings), Ltd., London, N.W.9. The greenhouse can be used for miniature plants such as alpines, cacti and small ferns. The material is, of course, completely water-resistant and very easy to keep clean.

Denture Brush

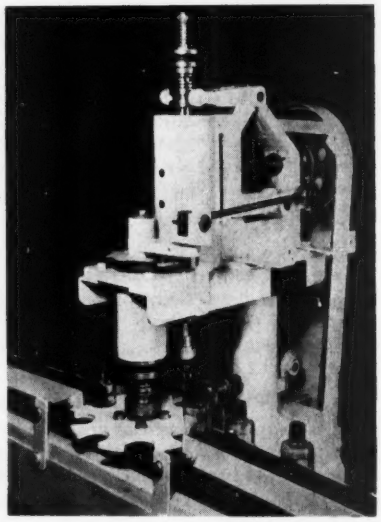
Most recent addition to the range of brushes manufactured by Halex, Ltd., 9 Conduit Street, London, W.1, is this specially designed denture brush. The tufts of nylon bristles are arranged in two groups for the most efficient cleaning of artificial teeth. The handle is injection moulded in clear transparent "Diakon" acrylic material, supplied by Imperial Chemical Industries, Ltd., Plastics Division.

Salad Servers

The pair of salad servers illustrated have been designed for Helenaware, Ltd., 3 Vere Street, London, W.1, by Gaby Schreiber and Associates, 7 Hobart Place, London, S.W.1. They are each 9 in. long and are made in three pieces—a transparent polystyrene bowl, a black polystyrene handle and a silver band at the neck, joining the two mouldings. One of the servers has a serrated edge for easy picking up of small particles of salad.

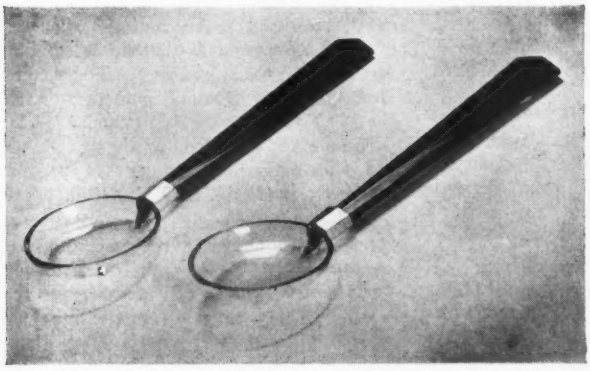
Plastics for Filling Machines

A fully-automatic eight-head vacuum-operated rotary filling machine has been produced by Gravfil Machines, Ltd., for filling bottles to a controlled uniform level. Since the requirements of the machine include that no metal of any kind must be allowed to come into contact with the liquid being filled, the filling section has been constructed in plastics materials, entailing the making of nearly 150 different parts, many of which are threaded or have been turned to close limits. The clarity of the acrylic material used enables the product to be inspected as it is being filled, and the general cleanliness of the machine can be checked at all times. Use of flexible p.v.c. connecting pipes permits the machine to be fitted with resiliently mounted filling heads, and the rigid material of which the major parts are made possess adequate strength for the machine to operate at over 60 bottles per minute without breakages. The photographs show filling heads, nozzles and filling tank, as well as non-return valves, machined by Gravfil, Ltd., from acrylic rod produced by BX Plastics, Ltd., Higham Station Avenue, Chingford, London, E.4. The automatic cap-tightening machine with Cobex turret plate is shown below.

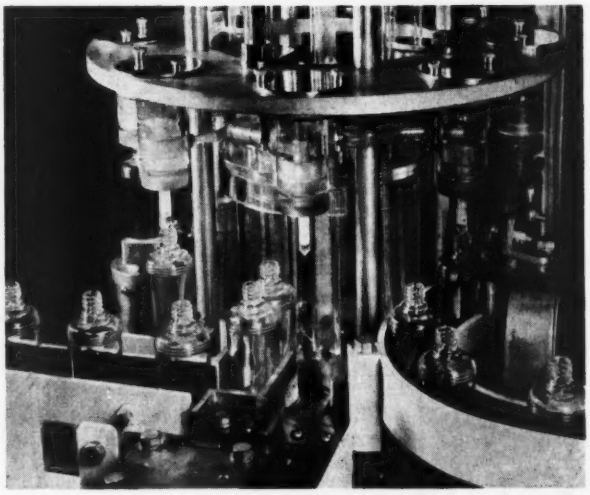


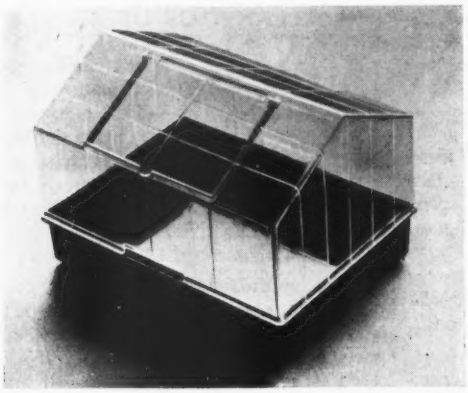
(Right) Automatic bottle-cap tightening machine with Cobex turret plate.

(Below, right) Machined acrylic parts of filling machine.

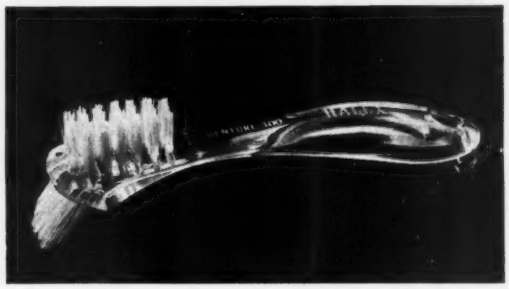


(Above) Polystyrene salad servers.





(Left) Miniature greenhouse moulded in polystyrene.



(Right) Nylon-tufted acrylic denture brush.

. . . for Industry and the Domestic Trade

VYBAK Plastics, produced in the new plant of Bakelite Limited, at Aycliffe, County Durham, include

PRESSED SHEET

Rigid and flexible grades for motor car side screens and back-lights . . . for belts and handbags . . . for chemical plant.

RESINS

Resins for surface coating. Resins for compounding and calendering will soon be available.

Write or 'phone for samples and data or call at

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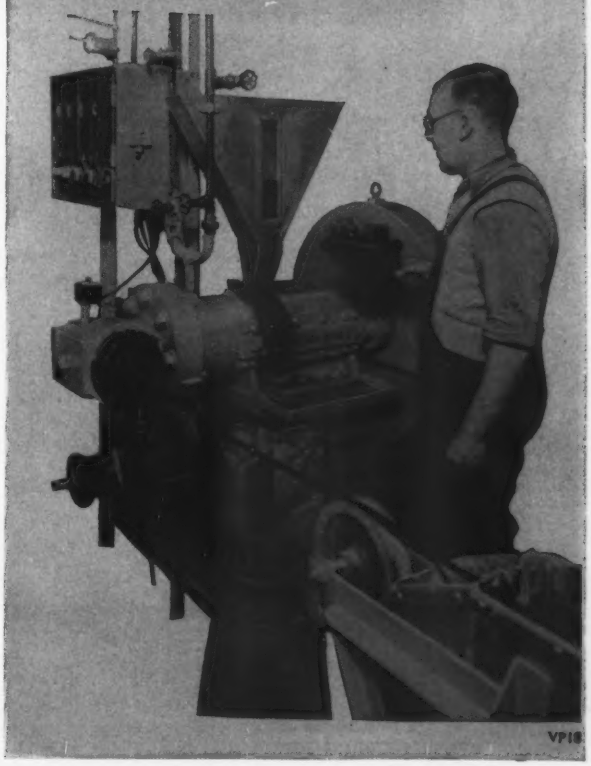

New from B.I.P.

A range of exhibits, large and small, demonstrates the versatility of low-pressure moulding with B.I.P. contact resins for bonding glass fibre. The high impact and tensile strength of such mouldings coupled with flexibility of the process, open up entirely new fields for these truly *structural* plastics materials.

low-pressure polyester/glass fibre laminates

See also these other B.I.P. Group exhibits:—

Stand No. A 18 New presses and tools exhibited by — B.I.P. Engineering Ltd. and B.I.P. Tools Ltd.

Stand No. A 13 Trade mouldings in thermosetting and thermoplastic materials—The Streetly Manufacturing Co. Ltd.

Stand No. B 3/4

British Industrial

1 ARGYLL STREET, LONDON, W.1

MELAMINE Ware for Catering Establishments

During the past year B.I.P., in co-operation with moulders and well-known stores, has carried out a series of exhaustive tests of MELAMINE ware in use. Now, fully confident of the performance of well-moulded MELAMINE ware, B.I.P. displays a comprehensive exhibit of these mouldings made from Beetle Melamine material. The exhibit will be of special interest to the catering trade.

* *The first large scale field test of Melamine Ware in use took place over a six months period in the Cafeteria of Littlewoods Store, Oxford Street, London, W.1. The above illustrations show Melamine Ware in use during the test ; it has now been adopted as standard equipment in this Store.*

lastics Ltd

B·I·P GROUP

NESTORITE

amongst "the gods"

It is well-known that the ancient Greek gods maintained a strategic position on Mount Olympus and to which, from time to time, mortals were invited. After all, mankind must ascend in search of fresh knowledge and thus attain new heights of achievement. So perhaps in 1953 it is symbolical that you will find Nestorite "high-up" at

THE BRITISH PLASTICS EXHIBITION

OLYMPIA

JUNE 8th—18th

at STAND No. B.15

GALLERY

where you are invited to ascend and rest awhile in the "upper circle" or domain of "the gods"—whichever description you prefer.

YOU'RE RIGHT WITH NESTORITE

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134, Avenue de Villiers, Paris 17, France.

JOSE DELCLOS MOLLERA
Angel Baixeras, 39, Barcelona (2), Spain.

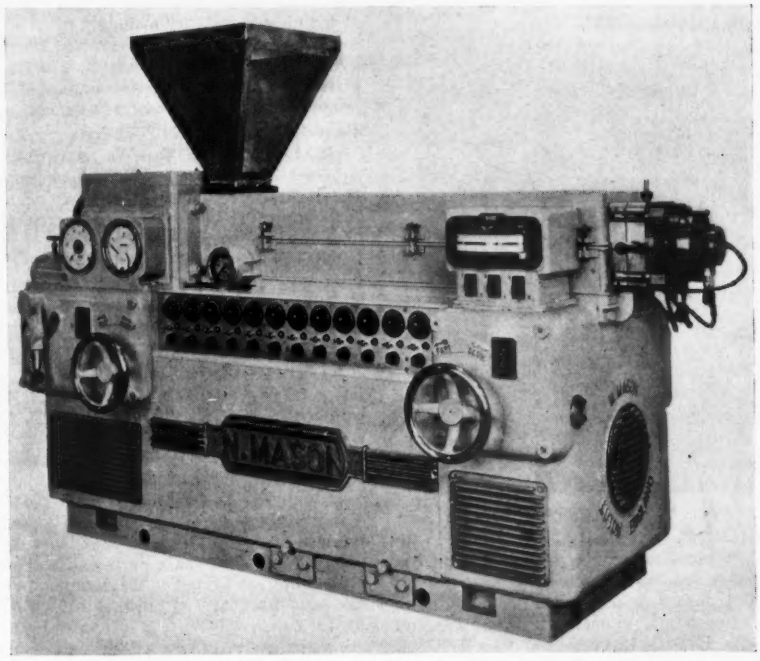
EINAR HOLMARK, 19, Gl. Kongevej,
Copenhagen V. Denmark.

Plastics NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

NEW EXTRUDER.—Details have just been received of the 4½-in. extruder manufactured by N. Mason of 28b Guildford Street, Luton, Beds. Driven by a 30 h.p. B.T.H. variable speed motor, 400-440 volts, 3-phase, 50 cycles, the machine is fitted with a Star-Delta starter. The cast-iron totally enclosed two-speed gearbox has all-steel gears running in oil. This gives an effective variable working range of 8-76 r.p.m. on the screw. All bearings are of the ball and roller type. The fitted screw, running in hardened steel, is water-cooled and is itself made of hardened steel.

The gate-type head is arranged for a 4½-in. die face with torpedo; in addition are fitted baffle plate and air intake tubes for tube extrusions. Feed of material to the barrel is by gravity from a removable hopper.



The new Mason 4½-in. extruder.

Control is effected with Sunvic thermostats, warning lamps, switches, fuses to control 12 band-type heaters giving a loading of 9,800 watts, and a Foster six-station temperature controller. An additional component which can be supplied is a cross head for wire covering. The illustration demonstrates the workmanlike appearance of this new machine.

TOOLCHROME LTD. report increased facilities as a result of the establishment of their new works at Billericay, Essex. Carrying full A.I.D. approval, the company is capable of extremely intricate work in the electro deposition of hard chromium for jigs, moulds and tools.

THE PLASTICS INDUSTRY EDUCATION FUND.—At the fourth meeting of the trustees held in early May, it was decided to invite Dr. V. E. Yarsley to become a trustee of the Fund in view of his broad interests and knowledge of the industry. Dr. Yarsley has accepted the invitation.

£1,200 has been allocated for the year 1953-54 to cover the expenses of students for full-time instruction at technical colleges. Progress in the preparation of revised monographs is reported to be good. Three more are with the printers and the editors have four further monographs in their hands. The trustees estimate that the total costs in respect of monographs will amount to £1,250 this year.

IMPERIAL CHEMICAL INDUSTRIES LTD. announce the retirement from the Board of Sir Wallace Akers and Mr. W. F. Lutyens. Their places have been taken by Dr. R. Holroyd and Mr. C. R. Pritchard.

INDEX TO "PLASTICS."—The index for volume 17 *of "Plastics,"* 1952, *is now available, price* 1*s.* 2*d. post free.*

REINFORCED PLASTICS.—A bibliography of articles on this subject has been compiled by the British Plastics Federation, covering glass and asbestos fibres. Literature references and patents are quoted of British and foreign origin. Copies can be obtained from the Federation, 47/48 Piccadilly, London, W.1, at a cost of one guinea.

BRITISH STANDARDS FOR POLYTHENE TUBING.—Two new British Standards dealing with the use of polythene tubing have been published recently. They are B.S. 1972:1953, "Polythene tube for cold water services" and B.S. 1973:1953, "Polythene tube for general purposes, including chemical and food industry uses."

Black polythene tube for use in cold water services and in flush overflow and warning pipe applications is classified into normal gauge and heavy gauge tubes. The standard gives the composition of the raw material, tolerances in dimensions, and details of a number of tests on both raw material and finished tubes. An appendix to the standard deals with properties of the material, methods of jointing, bending and finishing and gives figures of recommended working pressures corresponding to the test pressures of the specification.

The second standard deals with three types of extruded polythene tube: black tube for general use and in cases where the tube may be exposed to direct sunlight, white tube for use where the tube is not exposed to direct sunlight, and natural polythene where there is no exposure to sunlight and where the pressure of light will not be injurious to the material conveyed. Tolerances, methods of marking and tests are again given.

Although the publication of these specifications will not be startling news to people within the plastics industry, who are probably already aware of the potentialities of extruded tubing, this official recognition will for the first time enable municipal engineers and contractors to go ahead in the use of polythene in the knowledge that they are completely safeguarded and are using an officially recognized material with known characteristics and proved performance. The advantages of polythene are not only in competitive price compared with equivalent metal pipe, but in the ease of installation which comes from light weight, flexibility and the availability of long, continuous lengths. Complete resistance to corrosion from both water supply and soil will ensure that in most instances plastics tubing will outlive the metal. (It is estimated that £5 million a year is spent in this country alone on replacement of corroded cold water piping). Because of its insulating properties, water is less likely to freeze in polythene pipes than in other materials, and if freezing does occur, the tube will not burst because of its elasticity.

The history of these standards dates back some four years, at which time the British Plastics Federation first set itself the task of getting the standards established. Two years ago, the specifications were submitted to the B.S.I. and were examined by a technical committee consisting of representatives of Government Departments, users and manufacturers. The chairman was Mr. N. J. Pugh, City Water Engineer of Coventry, and past President of the Institution of Water Engineers, who was among the first water engineers to carry out large-scale polythene installations in domestic water supply.

The standards may be obtained from the British Standards Institution, 24 Victoria Street, London, S.W.1. (Prices are: B.S. 1972:1953, 3s. 6d.; B.S. 1973:1953, 4s.)

CENSUSES OF PRODUCTION.—The President of the Board of Trade has appointed a committee, including representatives of both sides of industry, to advise and make recommendations about future policy in regard to the taking of censuses of production and distribution. Mr. C. F. Merriam, M.C., chairman of British Xylonite Company, has been appointed to the President's committee which is distinct from the Advisory Committees on the censuses of production and distribution, set up to advise upon individual censuses.

THE BRITISH XYLONITE CO., LTD.—The company's report and balance sheet was issued in May for the year ended December 31, 1952. Payments to shareholders are as follows: Preference shares 5%, Ordinary stock 8%. Net profits have decreased from £237,572 for 1951 to £86,138 for the year under review. In the course of his statement, the chairman, Mr. C. F. Merriam, commented on the recession experienced by many sections of the plastics industry. B.X. Plastics, Ltd., felt the recession more than many in the industry because its main products, the cellulose plastics, experienced a more severe drop in demand than most other plastics materials.

MONSANTO CHEMICALS, LTD.—At the annual general meeting held on May 27, a net profit was announced for the year ended December 31, 1952, of £293,871. In the printed statement circulated to shareholders details are also given of Monsanto subsidiary companies' finances. The statement by the chairman gives a comprehensive review of the trading year and is well illustrated by photographs and statistical information in tabular form.

WALLINGTON, WESTON AND CO. LTD.—This company's Foremen's Club Annual Dinner and Dance was held at the George Hotel, Frome. During the course of the evening, Mr. C. J. F. Mitchell, managing director, delivered an address which has since been reported in other journals. Mr. Mitchell pin-pointed one of the many troubles of the plastics industry in this country during the recent year by referring to the very serious and ever increasing competition which is being met from German sources, largely due to the subsidy of German trade by substantial tax rebates on export deliveries. Mr. Mitchell stated the view of his company in forceful terms by saying "I do not think I shall be disclosing any secret if I tell you that now that materials are becoming free it has been decided to fight this German competition tooth and nail and to meet their prices even if it does not show any profit whatsoever to ourselves. We hope thereby to force the Germans to see reason."

MR. T. HALSE.—We regret to announce the tragic death of Mr. T. Halse, research superintendent, Permali, Ltd., at his home in Gloucester, on May 17, aged 38. After gaining an Honours Degree in Physics, he joined the research department of the Dunlop Rubber Co., Ltd. He came to Permali, Ltd., Gloucester, in 1943, to take charge of the rapidly expanding research and development laboratories. Mr. Halse had just been re-elected chairman of the Western Section of The Plastics Institute.

BRITISH INSULATED CALLENDER'S CABLES LTD. announce that their Lincoln Branch Office is now located at 113 Canwick Road, the telephone number remaining the same, Lincoln 654.

EXPORT INQUIRY.—The British Consulate-General at New Orleans reports that Fabrics Inc., 331 Bell Street, Montgomery, Alabama, are interested in receiving quotations for foam rubber for mattresses and leathercloth. The company specializes in the manufacture of cushions, mattresses, seats for chairs, etc., and U.K. manufacturers who are interested should contact the company by air mail sending quotations in dollars c.i.f., indication of earliest delivery dates and technical details. If available, catalogues and samples should also be sent. It would be appreciated if firms communicating with the New Orleans firm would copy their correspondence to the British Consulate-General, 1022 National Bank of Commerce Building, New Orleans, 12, Louisiana, so that the Consulate-General may follow up the inquiry on their behalf. Inquiries by telephone in connection with this circular should be made to Trafalgar 8855, Extension 7807.

Mr. J. E. Lonsdale

MR. J. E. LONSDALE who has been with BX Plastics Ltd., for the past eight years, has left that company to take up a position with British Nylon Spinners Ltd., at Pontypool. Mr. Lonsdale is a member of the Council of the Plastics Institute and was technical service manager and Cobex sales manager during the latter part of his association with BX Plastics Ltd.

H. J. ENTHOVEN AND SONS LTD. have sent us copies of technical bulletins 1, 2 and 3 together with a technical data sheet for dibutyl tin dilaurate. This material has been developed as a universal stabilizer for vinyl chloride resins and the manufacturers claim for it the following advantages: hydrochloric acid acceptance, clarity, inhibition of colour formation, anti-oxidant action, water insolubility, compatability and ease of incorporation. Recommended uses include extrusion, calendering, moulding and spreading.

Technical bulletins dilate considerably upon the foregoing information giving literature references, methods and applications and compounding techniques.

GOLF.—At the April meeting of the Plastics Industry Golfing Society held at Thorndon Park, Mr. F. C. Pullen of E. K. Cole, Ltd., carried away the "Steuart" Trophy. The "Austerity" Cup and Special Prize was won by Mr. F. A. Garrett of Rootes Mouldings, Ltd., and Mr. T. W. Fassett of Eastmead Engineering Co., Ltd. Detailed results are as follows:—"Steuart" Trophy Winner: F. C. Pullen (18) (E. K. Cole, Ltd.), 71 net. Runner-up: T. S. Crabtree (15) (Arrow Electric Switches, Ltd.), 75 net. "Austerity" Cup and Special Prize (Stableford Greensomes). Winners: F. A. Garrett (5) (Rootes Mouldings, Ltd.) and T. W. Fassett (16) (Eastmead Engineering Co., Ltd.), 36.3/16 points. Runners-up: A. E. S. Matthews (10) and Dr. S. J. Skinner (12) (British Geon, Ltd.), 34⅛ points.

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.—We have received a 40-page booklet dealing with Metrovick Infra-Red equipment. Admirably illustrated and produced, the booklet sets out to explain the technicalities and the equipment and also to demonstrate its wide application in many industries. One section deals with its use in the plastics industry including p.v.c. sheet, the pre-heating of p.v.c. sheet and Perspex, nylon setting and pre-heating laminated plastics prior to punching. Copies of this booklet may be obtained from the company at Trafford Park, Manchester, 17.

HELLERMAN LTD.—We have received a leaflet No. BH 501 which describes the Helvin Pressure Bung, reported previously in this journal. The device has been patented to facilitate the passing of electrical cables through pressure bulkheads in aircraft. The bung itself is moulded in a plasticized p.v.c. and has varying numbers and sizes of holes through it, open at the wide end and sealed by a thin diaphragm over the narrow end.

NEW COLOUR INDEX.—We are informed by the Society of Dyers and Colourists, 19 Piccadilly, Bradford, 1, that the second edition of the Colour Index will be published in 1955. The work has been completely redesigned and brought up to date with the co-operation of all the dye manufacturers in Great Britain, America, Western Europe, India and Japan. It will be published in three main parts and a special pre-publication price for the complete work has been fixed at £30 payable before June 30, 1953.

"BRITISH CHEMICAL PLANT."—The 1953 edition of this important work has been published. The directory has three main sections, the first giving a list of members and their overseas agents, the second illustrated section consisting of members' advertisements and the third a classified index of products and services prefaced by advice to inquirers.

CARTER GEARS, LTD.—A well-produced and highly informative booklet is obtainable from Carter Gears, Ltd., Thornbury, Bradford, describing the company's range of hydraulic infinitely variable speed gears.

MR. W. G. LAXTON.—We regret to record the death on April 16 of Mr. W. G. Laxton. An executive of the Plastics Division of E. K. Cole Ltd., he joined the company in 1944. He will be greatly missed by his colleagues throughout the country.

LACRINOID PRODUCTS, LTD., announce the following staff changes. Mr. C. W. Tringham has been appointed production controller of the company; Mr. H. H. Goulding has been appointed production buyer, and Mr. E. Emslie is now in charge of sales of all the company's finishing and polishing materials.

E. K. COLE, LTD., announce two staff appointments. Mr. W. A. Skellern has been appointed sales office manager and will operate from the London office and showroom at 5 Vigo Street, W.1. Mr. H. W. Theobald has been appointed commercial office manager and will be situated at the company's works at Southend-on-Sea.

INSULATORS, LTD.—Mr. H. F. W. Head has been appointed assistant general manager at Insulators, Ltd., Leopold Road, Angel Road, Edmonton, N.18, and commenced his duties on May 4. He has previously been employed by E. K. Cole, Ltd., for approximately 20 years, and has spent 10 years in the plastics division of the company.

ERRATUM.—On page 148 of the May issue the manufacture of the Handley Rigg baby rocker was incorrectly attributed to Precision Products (Leeds), Ltd. In fact, this company fabricates the acrylic component, the complete unit being manufactured by R. B. Production and Engineering, Ltd.

On page 147 reference is made to a drinking cup fitted in an arrangement suitable for a patient confined to bed. The actual cup has the trade name "Doidy" and is manufactured from a urea material by Martin Russell, Ltd., 143 Cannon Street, London, E.C.4.

THE NEXT 10 YEARS (*Continued from page* 181.)

other metals. Or the question may come up during a discussion on a real fear of shortage of metal ores in the earth.

The only technical answer possible is that replacement of metals by plastics should only occur when such replacement introduces an improvement in some characteristic. Hundreds of such replacements have already been made, typical examples being the use of plastic bearings in steel mills that have long outlasted the traditional phosphor-bronze type, or the elimination of metal bolts in certain parts of the Comet airliner by synthetic resin adhesion of metal-to-metal. Again, gear-wheels moulded from nylon are now widely used in many mechanical devices. Once the strength requirements of the job are properly analysed and satisfied by plastics, the mouldability, corrosion or abrasion resisting properties, transparency, colour, etc. of plastics may introduce important economic and technical advantages.

Zinc-alloy die-castings have often been successfully replaced by plastics in the past, and it is opportune, in view of the present high cost of zinc alloy and the low specific gravity of plastics in general to compare the cost of these two materials on a weight-for-weight basis.

	Zinc Alloy	Plastics
Specific Gravity	7.1	0.94-1.35
Cost per ton	£100	£150-£450

Presuming we are dealing with zinc die-castings each ¼ lb. in weight and we wish to replace them by plastics exactly as to size and design, then, for an expenditure of £100 we obtain:

Number of zinc die-castings
$$2{,}240 \times 4 = 8{,}960$$
Number of plastic mouldings
$$= 15{,}000\text{-}30{,}000$$

The above figures, while giving only a part of the story, should at least be borne in mind when considering the whole problem. Suitability of purpose, however, remains the prime factor.

POLYESTERS (*Continued from page* 206.)

of the variations in method of supply, it is important to follow the maker's instruction carefully.

The main use of these resins is for lamination. A cloth or mat of the required material is impregnated with the viscous liquid prepared as above, the laminate is built up from this impregnated fabric, and the assembly is set aside to cure at room or some elevated temperature. The only pressure needed is a slight one sufficient to keep the assembly together till the resin has cured. Some resins are inhibited by air during cure. The advantage of a cold-setting, non-air-inhibited resin would at first appear to be considerable. But if these laminated products are to be mass produced metal tooling will be justified, if not essential, in order to take advantage of the more rapid curing at elevated temperatures. When mating metal tools are used, air inhibition is not important, as, once closed, air is excluded from the mould cavity. For prototype and for short runs, a cold-setting, non-air-inhibited resin is desirable.

At present the preferred material is glass fibre in the form of cloth or mat. The physical properties of the finished laminate will depend on the nature of the cloth or mat, on the excellence with which it is wetted by the polyester, and on the polyester itself. Thus, unidirectional fabric will be used when the maximum strength is required in one direction, and when local areas need reinforcement. To obtain a good bond between the glass and the resin it is necessary to remove size by heating or washing, and in some cases to surface-treat the glass. In America there are a number of such treatments. One is based on a methacrylato-chrome complex, and another on vinyl-trichlorosilane. In this country we have the following glass fibre products: woven cloth, diamond mat, chopped strand mat, chopped fibres, rovings; but as yet only one treatment such as those that are available in America can be obtained here, and that is based on a methacrylato-chromium chloride.

Other laminating materials are those with a cellulose base such as paper and cotton cloth, and those with an asbestos base. These are cheaper than glass fibres and are more easily wetted by the resin, but do not have such heat, moisture or chemical resistance, or such high physical strength. For many applications, however, they will produce quite satisfactory products. Outside the general-purpose physical and mechanical properties, glass fibre reinforced materials have certain special properties:

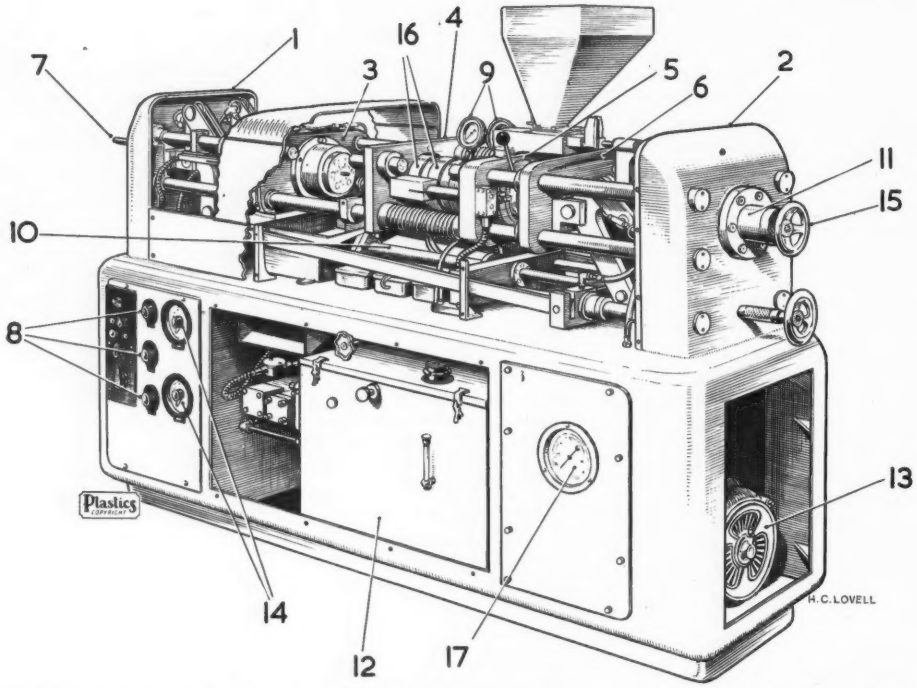
(i) X-ray and radar transparency.
(ii) High impact resistance (also when damaged the damage is localized and easily repaired).
(iii) Completely non-corrosive.

In the near future certain successful applications of glass-fibre laminates will be considered. In this we shall consider the principles which should be followed to ensure successful application. The first obvious principle is that their use should be dictated by specific technical reasons. Here we have the outstanding example of radomes with the electrical transparency requirement of radar. The second principle is that the material should be used on a cost or weight-saving consideration. Against this must be considered the two facts that many industries are equipped to work in metals and wood, and that transfer to plastics will entail complete reorientation of thought and, secondly, that the present annual supply of glass fibre and of polyester resins can be counted in hundreds of tons only.

The other use for these resins is in the production of moulding compositions. The viscous mixture of polyester, vinyl monomer and catalyst is used to impregnate a mixture of fibrous asbestos or glass fibre—and mineral fillers—slate dust or clay. This putty-like mixture can be compounded to give very rapid cures of the order of 20 sec. at 150° C. Alternatively, it can be trowelled onto large moulds and allowed to self-cure at room temperature.

Machines for the Industry

Dowding Automatic "Fast-cycling" Machine



1.—End castings.
2.—End castings.
3.—Platens.
4.—Platens.
5.—Platens.
6.—Platens.
7.—Ejection bar, centrally actuated.
8.—Sunvic regulators for injection cylinder heaters.
9.—Thermostatic dial thermometers.
10.—Hydraulic cylinder for platen movement.
11.—Injection piston.
12.—Hydraulic equipment, situated behind the removable panel.
13.—7 h.p. motor.
14.—Chamberlain and Hookham process timers.
15.—Handwheel for injection piston adjustment.
16.—Heater bands.
17.—Pressure gauge.

HIGH output is the key factor in developing modern moulding equipment, and attention has been focused on this problem in a number of instances in recent months. Most outstanding has been the report on plastics moulding by the Productivity Team which visited the United States last year. Great emphasis was placed on the achievement of high output by the use of what are called "fast-cycling" machines. Increase in the rapidity of the cycle offers obvious economic advantages, not only connected with pure output; materials coming to the fore, one of which was reported in the May issue of *Plastics*—"Techniques of moulding polytrifluorochloroethylene"—demand more rapid close-to-close time if successful moulding is to be achieved.

One of the machines developed to meet these demands is the new 2-oz. injection moulding machine now marketed by Dowding and Doll and designed to deal with all modern plastic materials, including nylon. One of the advantages claimed is that with the high rate of moulding cycles, 1,200 per hour, moulding costs can be reduced by the use of simple tools, of one or a few impressions, as distinct from the larger machines operating at a slower cycle and having more expensive multi-impression tools.

The design follows orthodox lines in essential features. End castings (1 and 2, see drawing above) and platens (3, 4, 5 and 6) are mounted on four horizontal tie bars. Ejection is by a centrally actuated adjustable bar (7). The machine is closed by an automatic toggle mechanism. The injection cylinder is heated by two internal band-type heaters of 750 W. and one of 1,000 W., all thermostatically controlled by Sunvic regulators (8) and equipped with two thermostatic dial thermometers (9) giving a range of 100 to 700° F. (38-353° C.).

Vickers-Detroit V.2305C pump and valves are used. Both hydraulic cylinders for platen movement (10) and injection piston (11) incorporate piston ring design of piston. The whole of the hydraulic equipment is mounted in a separate tank (12) which is readily removed for service. The hydraulic pump is driven by a 7 h.p. motor (13). Two Chamberlain and Hookam process timers (14) are fitted to ensure accurate repetition. Overall the machine is 7 ft. by 2 ft. 4 in. by 5 ft. 4 in. and the weight is approximately 2,500 lb. As a standard unit it is encased in pressed steel and working parts are easily accessible through hinged flaps secured by clips.

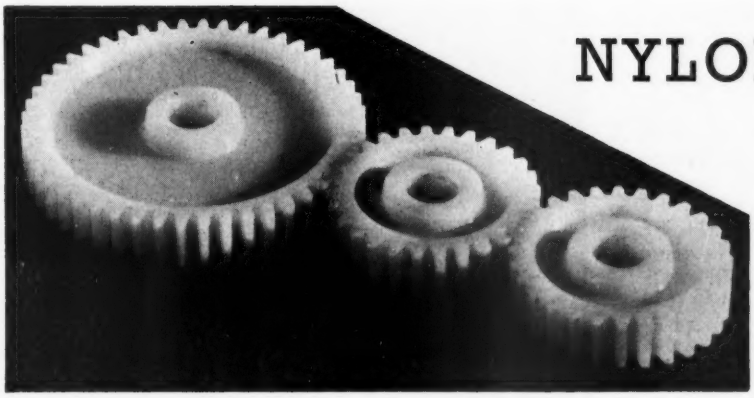
A handwheel for injection piston adjustments is located at (15). Heater panels can be seen at (16) adjacent to the thermostatic dial thermometers shown at (9). The pressure gauge is located on the side of the machine at (17).

The maximum projected area is 15 sq. in. and the plasticizing capacity is 22 lb. per hour. Fully automatic lubrication connections are provided to all moving parts.

Special provision is made to stop the machine automatically should faulty ejection occur. This ensures foolproof operation and permits a battery of machines to be supervised by one operator.

(Information for this article supplied by Dowding and Doll, Ltd., Greycoat Street, London, S.W.1.)

Dowding automatic machine.



NYLON MOULDINGS

Some Notes on the Behaviour of Components Moulded from Nylon Including some Important Test Results

By E. E. HALLS

In this article the author sets out to review the general properties of nylon in moulded form. Notes are given on such points as chemical resistance, water absorption, electrical properties and mechanical strength. He then goes on to describe certain tests that have been carried out ; important results are recorded in tabular form. We acknowledge herewith photographs of nylon mouldings supplied by the Plastics Division of Imperial Chemical Industries Ltd.

IT is gratifying to note that nylon as an injection moulding material is becoming available in this country, and that nylon mouldings are establishing themselves in critical applications. This material has its own specific qualities, and, as with many of its predecessors, it must be regarded as complementary to other established moulding materials, and not as a substitute. Thus its major applications are likely to be for purposes for which no existing material was entirely suitable, and in some cases for jobs where it can give better performance on account of dimensional accuracy, superior toughness, better wear resistance, or other inherent characteristic.

Nylon moulding in this country is admittedly in its infancy and much has to be learned with respect to design for moulding, actual moulding technique, and performance of the moulded article. The latter refers to its qualities of mechanical strength, physical properties of wear resistance and dimensional stability, chemical characteristics of inertness and resistance to weathering or atmospheric conditions, and perhaps oil, solvent and chemical resistances, and electrical attributes. Different applications are concerned with one or more of these properties and they are rarely all involved in any particular sphere. The highest properties can only be expected from the right raw material processed in the most suitable manner, to yield an article appropriately designed for the processing technique evolved. It is not novel to stress the need for close correlation between these factors, but it is evident that knowledge can only be obtained from practice. The gradual adoption of nylon mouldings by the engineering industries is therefore welcomed so that such information can be acquired. Some disappointments may at first be encountered, but many utilitarian uses for the material are already assured.

One grade of nylon granules for moulding in natural colour is available, and moulders can undertake pigmenting to provide for a range of colours. In America, the material has been established for a long time and a full colour range is obtainable. Moulders in this country have the advantage of much experience gained with the material by moulders in the United States.

Photograph above is reproduced by courtesy of Imperial Chemical Industries Ltd., and shows nylon gear wheels manufactured by Plastic Engineers Ltd., Treforest.

General Properties

The general properties of nylon in moulded form may be briefly summarized as under:—

(a) Low density.
(b) High softening temperature.
(c) Toughness, with good mechanical properties of resistance to impact, tensile strength and cross-breaking strength.
(d) Some degree of hygroscopicity, so that a changing equilibrium with exposure to fluctuating humidities results.
(e) A considerable degree of resistance to chemicals.
(f) Non-toxicity.
(g) A good level of electrical properties, although nylon is not a low-loss material.

As an engineering material, the low density (specific gravity about 1.14 for the natural material) is an attractive proposition for one of high mechanical values. The high softening point renders the material acceptable for a wider range of service conditions than is the case with many other thermoplastics. There is, however, a limit to safe service operating temperature, and although the material does not "unmould" (i.e., temperature distort) till about 230° C. (450° F.), it discolours and loses toughness if exposed for extended periods above 150° C. (300° F.), and a maximum temperature under load is of the order of 135° C. (270° F.). In engineering applications, and for electrical purposes in particular, where clamped assemblies are common, this is of importance, and it is a field from which practical data on the point must be accumulated before the limiting safe procedures can be established.

Toughness and strength, especially resistance to impact shock, are among the most attractive properties of moulded nylon, leading to important applications in bearings and gears. The only serious drawback of the limited hygroscopicity is fluctuations in dimensions corresponding to the absorption or loss of moisture.

The chemical resistance means safe use in many solvents and chemical solutions, and in atmospheres contaminated with chemical fumes. Non-toxicity enables the material to be used for articles that are used in contact with the human body without the development of any kind of dermatitis or other poisonous infection, and in surgical and medical applications.

The level of electrical properties, with particular reference to electric strength and insulation resistance, enables the light electrical industry to take advantage of the unique mechanical properties of nylon in its apparatus and equipment.

The provision of satisfactory nylon mouldings possessing these high properties is dependent upon the acquiring of the special processing technique in moulding. Although a thermoplastic, nylon moulding is quite different from that of the

older-established injection, e.g., cellulose acetate, ethyl cellulose, cellulose acetate butyrate, etc. High melting point and sharp melting, as contrasted with a broad plastic range, account for this, and they result in the need for higher temperatures being needed for the moulding operation and closer precision in temperature control, as well as special design for the injection feed. Attention must be given to these factors if mouldings of uniform properties and free from undesirable strains are to be ensured. Principle and practice have been soundly established in America, and are being followed successfully in this country.

It is important to note that nylon is susceptible to moisture, and that this applies to the granules for moulding as well as to the moulded article. The moulding powder, received in sealed tins, must be kept dry by maintaining the seal when not in use, and if inadvertently exposed to the atmosphere for any length of time (even an hour or two), should be carefully oven-dried in an air-circulated equipment before use. Maximum properties cannot be expected from damp powder.

Another practical point refers to moulding temperature. The material melts fairly sharply at about 263° C. (505° F.) and does not become progressively more rubbery to any appreciable extent as this temperature is reached. About 20° C. above the melting point, oxidation rapidly occurs so that a temperature below this should be the target in the injection cylinder. About 278-280° C. (530-535° F.) is the maximum, and close control is obviously necessary. The mould temperature is important and it is advisable to control it from several points, and it must be high enough to prevent premature setting-up of the moulding before the mould is completely filled and the final pressure applied. If these conditions are not fulfilled, the moulding will not be properly knitted together, undue strains may be induced, and a stable moulding of best properties cannot be expected.

The contraction in passing from liquid to solid (crystalline) state in nylon is high, about 16%. The mould shrinkage is also high, 12 to 18 mils per in., according to conditions, the nature of the moulding and the axis concerned in relation to the injection line, being greatest in the latter direction. Post-moulding shrinkage may occur, and this can amount to 2 mils per in. maximum, becoming stable in this respect in several weeks. More data is required from experience on this. Another dimensional change occurs in the moulding due to humidity, and the nominal value quoted both in America and in this country is about 8 mils per in. change from maximum dry condition to 100% humidity at room temperature. Small, thin section items may change less, and heavy or large mouldings more. In any case, the closeness of moulding conditions to the ideal have some influence upon all these dimensional factors.

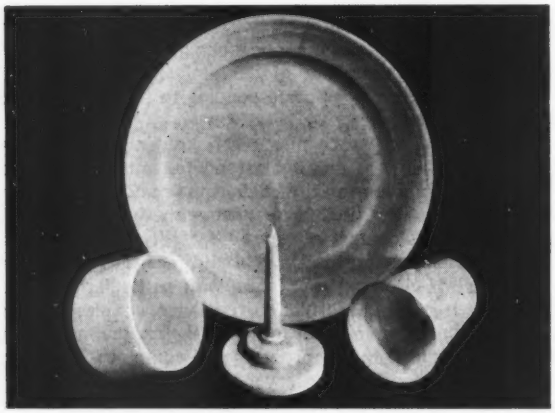


Fig. 2. Nylon injection moulded cup, plate, mug and testpiece by I.C.I., Ltd.

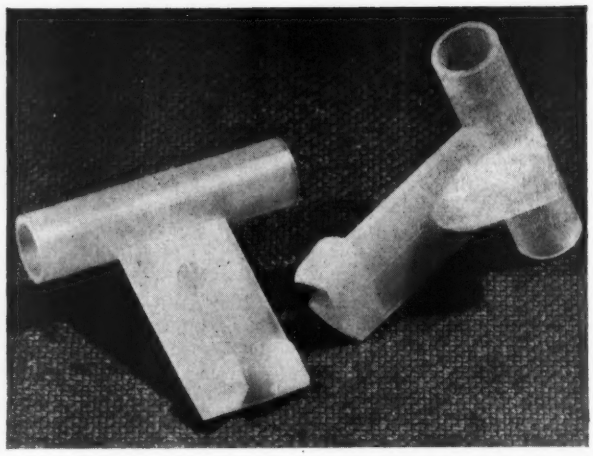


Fig. 3. Textile traverse guides injection moulded by Punfield and Barstow (Mouldings), Ltd. Photo courtesy Imperial Chemical Industries, Ltd.

Fines in the moulding powder are to be avoided, because it has been shown that strength and toughness qualities are adversely affected. This is primarily on account of oxidation at the injection temperature, and is possibly due partly to air inclusion and partly to rate of heating.

Mechanically, nylon shows high impact, the value being slightly under 1 ft./lb. per in. of notch (Izod), tensile strength of 3 to 5 tons/sq. in. and cross-breaking strength 5 to 7 tons/sq. in. There is a gradual increase in impact and decrease in tensile strength with temperature rise, or with increase in water content.

Electrically, electric strength is high with instantaneous break-down voltages of 300 to 400 volts/mil at 25° C. Volume resistivity is fair of the order of 1×10^7 megohms/cm. cube, but insulation resistance between inserts after water immersion is very good. Power factor and permittivity at 25° C., measured at 1 megacycle, are of the order of 0.02 and 3.8 respectively, and both are of similar order when determined at 60 cycles. The material is obviously not a low-loss dielectric, but very good for losses at ordinary cycles. Experience is sought from electrical applications on the performance of the material under field trials or service conditions.

Regarding chemical resistance, nylon offers good service against attack from a wide range of materials, but is damaged by others. High resistance is exhibited to a wide range of organic solvents, such as esters, ketones and alcohols. Good resistance is also shown against alkalies, but only against weak acids and solutions of inorganic salts. Strong acids, oxidizing agents and the phenols rapidly attack the material.

Test Data

A nylon moulding 2½ in. in overall length, $\frac{11}{16}$ in. in width and $\frac{3}{16}$ in. in thickness was examined after 24 hours' immersion in distilled water at 25° C. Data shown in Table 1 were recorded. The water-absorption and dimensional changes are

Table 1.—Behaviour of nylon moulding during water immersion for 24 hours at 25° C.

Water absorption, per cent.	1.0%
Increase in length, mils per inch	0.70
Increase in width, mils per inch	2.15
Insulation resistance between inserts at 1½ in. centres	> 150,000 megohms

appreciable for a short immersion period. The direction of injection moulding was along the length axis, and this shows the smaller expansion. Electrically insulation resistance was very good, being "infinity," i.e., beyond the limit of the measuring instrument.

Table 2—Behaviour of nylon moulded spool under extended water immersion conditions at 25°C.

Period of immersion in days.	Mils per inch change in:—			Change in weight per cent.
	(a) ½" cheek dimension	(b) ½" length dimension	(c) 5/32" core dimension	
1	+2	+2	−20	+3.5
7	+17	+18	+6	+7.5
30	+20	+21	+20	+7.3
90	+20	+20	+15	+7.1
180	+19	+21	+12	+6.9

Table 2 refers to extended water immersion of a thin-walled spool for an electrical coil former. Stability was attained in less than a month, but water absorption and dimensional changes were high and relatively uniform (taking into account the difficulty of recording dimensional changes accurately on the smallest dimension).

Table 3 refers to a portion of moulding of overall dimensions $\frac{1}{16}$ in. diameter, 1 in. long, injection direction being in the length axis. The first cycle was subjected to dry oven heat for 16 hours at 70° C., when loss in weight occurred; shrinkage in diameter was particularly noticeable here.

Table 3.—Behaviour of nylon moulding under hot dry and hot wet conditions.

Test condition, successive cycles.	Mils per inch change from original in:—		Change in wt. per cent.
	(a) Length	(b) Diameter	
a) Dry heat, 16 hrs. at 70°C.	−7	−17	−0.8
b) Wet heat, 16 hrs. at 55°C.	None	None	+0.8
c) Wet heat, 16 hrs. at 55°C.	+3.5	None	+1.1
d) Wet heat, 16 hrs. at 55°C.	+3.5	None	+1.1

The second cycle was 16 hours at 55° C. with 100% humidity, cooling in the wet cabinet for the remainder of the 24 hours. This brought the dimensions back to the original, and caused an increase in weight due to absorption. A further wet cycle resulted in a marked increase in length and further increase in weight. A third wet cycle caused no further change.

The outstanding point of note from all the wet tests is the relatively short period in which stability to the conditions imposed is obtained. This is a shorter exposure period than is experienced with all the cellulose thermoplastics.

It is important that information upon dimensional stability of nylon mouldings under varying conditions be obtained, and cared for in designs as far as practicable. Information from service is also needed on the permanence of electrical properties.

Light weight and toughness make the material attractive in the electrical industry for parts subject to impact shock, compressive strains and rough usage, e.g., plug bodies, switch cases, coil formers and general purpose mouldings. The same properties, together with a self-lubricative effect, makes nylon mouldings suitable for gears for light loads. Nylon to nylon, nylon to steel and nylon to phosphor bronze are satisfactorily used. Nylon to brass is not satisfactory as the brass fails, the reason not yet being clear, but corrosion fatigue due to the presence of amino groupings being a possibility. Extended experience in this country in all these applications has to be gained.

Nylon as a material for moulded components is in its infancy here, although several moulders have established a processing technique and a number of applications are regularly using the material. It is undoubtedly a utility material and not one of mere novelty application. It seems certain that it will claim its own rightful fields of exploitation with satisfactory results, and that the precision required in process control, as well as the limitations in properties, with special reference to swelling under damp conditions and shrinkage upon dry exposure, will be appreciated and given due regard.

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped and addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Transfer Moulding

SIR,—It has been noted that in your article under the heading of "An Achievement in Transfer Moulding," relating to the manufacturing technique carried out by Ferranti, Ltd., on their Meter Case Backs, you refer to transfer moulding as an uncommon moulding practice in this country. We should like to point out that our company, like other leading moulders, have for many years adopted and extensively used this technique where it would result in an improved product.

Accepting transfer moulding as a standard practice, we automatically consider all thermosetting mouldings with a view to determining whether the transfer or standard compression moulding technique will produce the best component. The decision as to which technique should be adopted is usually clear-cut, as the design of most components readily suggests which would be the better method.

Additional advantages of transfer mouldings to those already mentioned in your article are the elimination of porosity and the overall precision of the mouldings, due to the fact that the tool is fully closed and under locking pressure before the phenolic material is injected.

J. KENYON,
Universal Metal Products, Ltd.
Pendleton,
Salford, Lancs.

Polystyrene Casting Resin

SIR,—We are anxious to contact a firm able to supply us with a pure polystyrene-based casting resin, suitable for use with rubber or p.v.c. moulds. Other casting resins, such as polyesters, have been found unsuitable for our purpose. We understand that rods, tubes and sheet are formed in polystyrene by this method. Specifications should include low shrinkage, low thermal expansion and no ash after combustion; actual strength is of no great importance.

A. T. LONG AND SONS, LTD.
31-33 Selwyn Street,
Onehunga, S.E.5,
New Zealand.

Non-sticking Material

SIR,—We understand that the General Plastics Corporation of New Jersey, U.S.A., produce a material called Teflon which effectively provides a non-sticking surface for rollers, etc. In our veneer shop we use synthetic glues which are applied by rollers and we are very anxious to salvage the machine cleaning time lost at the end of each day's run.

We should be grateful if you could advise us whether the above material or something similar is available in this country, and if necessary provide the name of the supplier.

GORDON RUSSELL LTD.
Broadway,
Worcestershire.

Improving the Quality and Efficiency of Plastics Moulding—I

By W. M. HALLIDAY

The author examines some recommendations of the recent Productivity Report on Plastics Moulding and suggests some practical measures to be taken by moulding companies and trade organizations to put these recommendations into practice. The need for training skilled technical salesmen is emphasized and educational courses are suggested. A questionnaire to give the moulder details of the customer's requirements is also suggested.

THE Report on Plastics Moulding issued by the Anglo-American Productivity Team of British Plastics Technicians is admirably comprehensive and illuminating. It should be stimulating to all concerned with the interests of the industry and the development of efficient moulding practice, methods and designs.

The various recommendations accompanying the report are, perhaps, its most interesting and valuable feature. These cover almost every phase of activity and certainly call for long overdue attention to the many problems surrounding the quality and economy of plastics moulding, improved moulding procedures, closer liaison between moulder and user, and so forth.

Much can be done by moulders, both in their individual capacity and collectively, through existing trade organizations, to give practical effect to many of the recommendations proffered.

Some 14 specific recommendations are presented, covering 47 different and important aspects of works organization, labour management relations, moulding practice, tool design, plant and moulding equipment, and so on. These summarize the comparative findings and experiences of the team arising from their investigation of plastics moulding practices, organization and methods in the U.S.A. and in this country.

Critical study of these recommendations would undoubtedly lead to the presentation of further constructive ideas, the pooling of which would offer opportunities of accomplishing something worthwhile on the lines put forward by the team.

In the hope of introducing such discussions and the eventual inauguration of helpful practical measures, brief examination is here made of some of the main points put forward in the Report. Further suggestions are also offered respecting some equally important matters not covered in the Report.

1. Co-operation and Liaison Between User and Moulder

To one who has written much in *Plastics* upon many of the points embraced in the team's Report, notably about effective co-operation between prospective users of mouldings and moulders, Recommendation 5 is specially welcome.

> " Product designers should be encouraged to co-operate fully with the moulder in the development stage of their work so as to make the best possible use of the process of plastics moulding, from the points of view of both economical production and attractive appearance of the product."

Such co-operation is very desirable, indeed essential. Most moulders can make some helpful contribution by taking steps to improve understanding and relations with their own particular clientele; or by giving full and sympathetic support to all practical measures organized collectively by the industry.

This recommendation—as worded—rather overlooks one important phase of moulding, i.e., that of the precision-type mouldings required for industrial or engineering purposes. With these, correct functioning, close accuracy and uniformity of shape, rather than surface finish or appearance, will be the predominant requisites.

The development of markets for such precision type mouldings entails far more spade-work and co-operation between potential user and moulder because of the numerous and difficult technical issues involved relating to component and mould designs, selection of best materials for specific working conditions, moulding requirements, inspection and test of products.

Salesmanship in such cases must be backed by considerable technical knowledge, and practical experience in the working of plastics materials to show engineers or other industrial users how older engineering materials can be replaced in many cases by plastics to give equivalent or even superior service performance, greater economy and all-round satisfaction. Co-operation between user and moulder may serve a more important purpose than is suggested in the report. It will, in fact, ensure that products will be functionally sound, dimensionally correct to the finest possible limits and in conformity with all other requirements.

Precision features are notoriously much more difficult to reproduce in plastics mouldings for several reasons. The chief difficulties are:—(a) Greater complications of component and mould designs which often render it more difficult for the moulder to gain a correct or complete understanding of what is required, particularly with inadequate guiding information.

(b) Control over operating conditions.

(c) Elimination of variable factors affecting sizes, or shape, etc.

(d) Selection of suitable materials, or methods of manufacture to ensure the necessary properties in the finished moulding.

(e) Determination of precision inspection tests to guarantee continued adherence to the user's specifications or tolerances.

Many of these difficulties may be eliminated or greatly minimized for the moulder by means of informed technical salesmanship.

2. Technical Sales

Unfortunately the team does not give any guidance upon the comparative use and effectiveness of such technical salesmanship in the industries of respective countries.

Much greater attention should be given to this side of moulding activities, because it offers a valuable means for generating and sustaining frank, full and sympathetic co-operation between the user and moulder. The salesman who is competent in the technical aspects of plastics materials, moulding requirements, and preferably who has actual moulding and mould-making experiences, may form a most effective link between moulder and user in the following ways.

Very often the salesman makes the first introductory contact with a prospective user of plastics. Specific moulding jobs are submitted to him for judgment. His advice is sought on innumerable matters outside the knowledge or capacity of the user. He may have opportunities of discussing the project with the actual product designer, thus learning precisely what features are desired in the eventual moulded article. He may be shown a prototype model of the proposed moulding as envisaged by the user, and be requested to give advice as to its mouldability, features, etc. He may also be shown the actual working conditions for which the part is required, or be given full details of the functions to be performed by the moulding.

If he is able to advise competently, this not only inspires the user's confidence and sets him working on the best lines for designing a part suitable for accurate and economical production, but the information gained will be of great help to the mould-designer and moulder later charged with the production of the job.

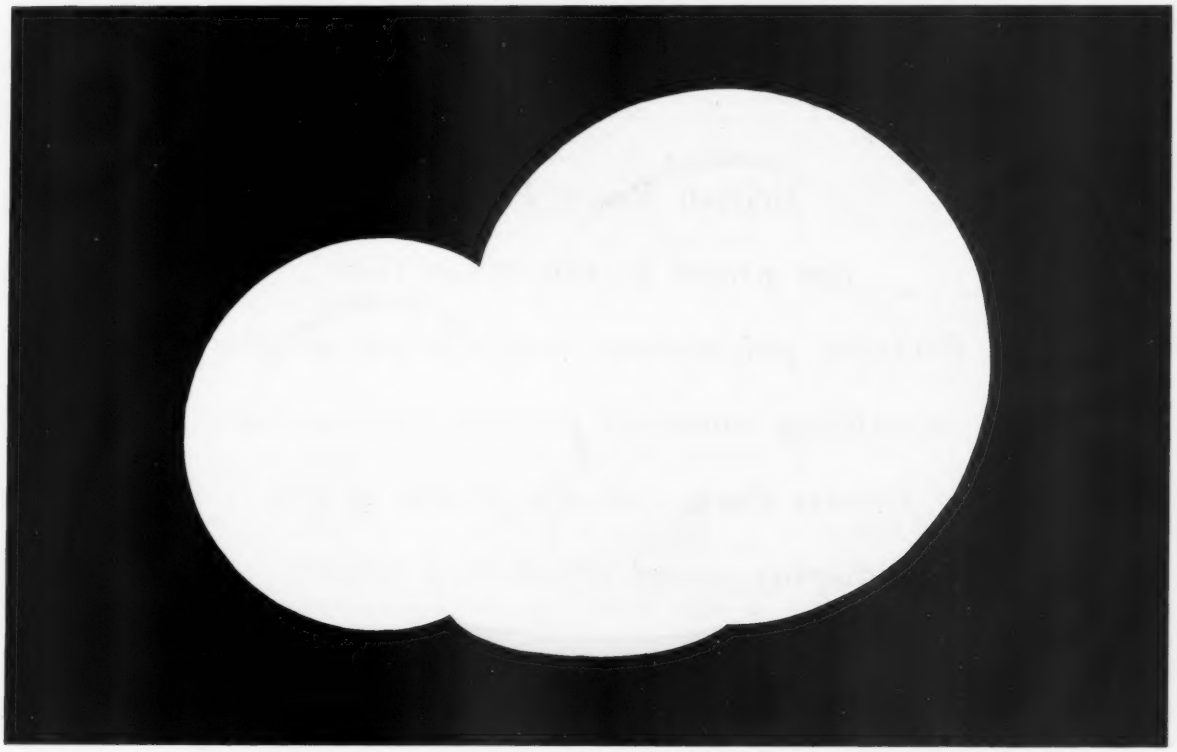
The salesman, therefore, should be able to appreciate technical points of this kind, to realize their importance to the moulder, and he should be able to transmit such information accurately to his moulder.

A well-informed and technically experienced salesman acting efficiently in the above-mentioned capacity can also obviate considerable delay and irritation. If technical details are carefully considered and made plain to user and moulder at the outset of a project, prolonged correspondence and questioning to elicit such information may be avoided.

The creation of a sales staff of this technical and practical character bespeaks intensive and well-planned training. This raises another important point.

As a general rule, the large size moulding company is better placed to train and employ such technically skilled salesmen, and introduction of effective training schemes presents no serious problem. With small moulding companies, however, innumerable objections may prevail to prevent much being done on these lines.

Courses of lectures, specifically designed for the guidance of salesmen to instruct



A selection of Tableware
moulded in Melamine by Ranton & Co. Ltd.
is included in the exhibit on the

B.I.P. Stand B 3/4

All Enquiries to

Ranton
& CO. LTD.

Trade Moulders and Manufacturer
of Rock Electrical Accessories

Commerce Road
Brentford Middlesex
Phone Ealing 5808 (3 lines)

250-17

British Resin Products are proud to announce that Distrene polystyrene was selected as the moulding material for the Coronation Crown Pack and the frame of the display stand illustrated below

All profits from the sale of the display stand will be given to the National Playing Fields Association and the Central Council of Physical Recreation, by Progressive Inventions Ltd., of Market Rasen, Lincs., to whom all orders should be sent (stand 5/- post free).

BRP

BRITISH RESIN PRODUCTS LTD

Sales and Technical Service: 21 St. James's Square · London S.W.1 · *Telephone:* Whitehall 8021

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Suggested questionnaire (right) to give moulder details of customer's requirements.

them in the basic principles and essentials of the different plastics moulding processes, or properties and applications of materials, etc., could doubtless be organized by some central society.

The subjects, tenor and purposes of such lectures for salesmen would, of course, have to be carefully selected to avoid all trespass upon legitimate competitive products, methods of production, or normal trading activities. This would probably make it possible for some of the smaller moulding companies to support such a scheme. It could, in fact, be specifically designed to cater for salesmen connected with such small firms, who thus would stand to gain most.

3. How is Co-operation to be "Encouraged?"

The governing term in Recommendation 5, previously mentioned, is obviously the word "encouraged." It is implicit that such encouragement is the prerogative of the moulder by reason of his more specialized knowledge and experience of moulding processes, etc.

How exactly is such "encouragement" to be generated, stimulated or best applied by a moulder?

Informative advertising by moulders, also strongly recommended by the Team (see Recommendation 8, page 70), can certainly assist in arousing interest and informing potential users about the possibilities of plastics. Yet it will probably only do this to a mild degree, sufficient, of course, to lead to further investigation into possibilities. This interest, however, will only be evoked at the very earliest exploratory stage in the development of a new project or component. In any case, informative advertising can only cover the most general principles, features and applications of plastics to indicate inherent advantages, etc. It cannot usually deal with individual applications or instruct as to the feasibility of introducing specific features or properties into a particular product.

From the angle of the moulder, and particularly that of the mould-designer, something more substantial is required, if effective co-operation is to be created.

The real problems affecting component and mould designs, for example, normally arise at a later stage, when the user has usually developed a tangible shape and form for his component. At this stage concrete issues arise as to the mouldability of this or that, whether such fine tolerances can be attained, whether plastics materials will withstand a given loading, or certain working conditions and so forth.

With any moulding project, particularly one embracing precision or unusual features, there will always be complex issues involved for the moulder.

The originator of the project may know exactly what he wants in the finished article, but because of his meagre technical understanding of moulding he may fail to appreciate why certain features cannot be reproduced, why others are unnecessarily costly, or why others are preferable. He may also, and frequently does, fail to make his requirements properly known to the moulder at the outset of such a project.

COMPONENT AND MOULDING REQUIREMENTS

WE thank you for the inquiry dated ..... requesting our quotation for the supply of Plastics Mouldings to your drawings/specifications Ref..... To facilitate designing and estimating requirements will you please furnish the following additional information?

1. **Working Conditions.**
   Can you describe the *exact* nature of the working conditions? State loading, wearing or other stressing. Advise whether articles will be exposed to oil, water, steam, acids, heat, cold, electric loads.
   .....
2. **Functions.**
   Can precise working duties be described?
   .....
3. **Properties.**
   Please state particular properties required in components, i.e.:—
   Electrical. Strength, sensitivity, power factor.
   Mechanical. Tensile, bending, crushing, impact.
   Physical. Water-absorption, heat loss, specific gravity, fastness to light, weight.
   .....
4. **Materials.**
   Do you know the character of the material to be used, i.e., phenolic, acetate, amino, vinyls?
   .....
5. **Shape and Features.**
   Do drawings clearly show shape, etc., required? Is a model available?
   .....
6. **Dimensions.**
   Do drawings or sample indicate *critical* dimensions with tolerances? Are latter as wide as possible? If not, state max. and min. values. Do drawings clearly show non-critical portions to which ordinary "open" tolerances can apply?
   .....
7. **Appearance.**
   Can you indicate quality of finish, appearance, neatness of flash-removal, colours, or scale of gloss required? Is a sample showing these available for inspection?
   .....
8. **Adaptations.**
   Please indicate all portions of component which may be modified in shape, size, feature or tolerance to obtain most efficient mouldability.
   .....
9. **Unusual Features.**
   Are there any other unusual features, conditions or requirements to be satisfied? If so, please give full description and details.
   .....
10. **Inspection and Tests.**
    Have finished articles to pass any *special* tests or inspection? If so, kindly describe same, and state type of equipment.
    .....
11. **Gauges.**
    Please state who is to supply gauges. If the moulder has to do so, kindly give full information covering nature of tests, etc.
    .....
12. **Quantities.**
    Is the quantity called for in the inquiry a maximum? If further quantities are envisaged, can the scale of these be indicated now, and periods over which deliveries will be required?
    .....
13. **Deliveries.**
    Will full quantity on the inquiry or order be required in a single batch, or spread over a period? If the latter, please advise delivery schedule in view.
    .....
14. **Costs.**
    Our customary practice is to quote part cost of moulds, tools, etc., as separate items from mouldings. Moulds thereafter remain in the moulder's possession for your exclusive use. Please state if you require any alternative arrangement.
    .....
15. **Mould Repairs Maintenance.**
    With the above practice, initial mould charges usually include all normal maintenance of tools to produce satisfactory mouldings to initial approved form. It does not cover major alterations to moulds or tools demanded by drastic departures from the original shape, size, features, etc., of component.
    .....

First, then, the moulder has to derive a clear and complete understanding of just what is required. He must visualize external and internal shapes, holes and their relationships, critical dimensions and so forth to assess how these may be reproduced.

He has to estimate the total permissible weight of the moulding, suitable wall thickness to meet working stresses, where these are known and similar facts. He will also have to envisage the design and production of an economical mould for such a part.

He must calculate all these things from the information supplied by the user. This will usually be in the form of drawings, or written specifications, sometimes a model of the part to be made, frequently by written specifications, and on occasions by instructions given through a salesman.

(*Continued on page 226*)

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2s. 8d. each (including postage).

B.P. 683,956. Manufacture of paper. J. Knaggs.

The wet strength is improved by melamine resin associated with a colloidal inorganic loading material (especially for hot humid countries).

B.P. 683,958. Manufacture of protein plastics. To: Wm. A. Mohn and Sön A/S (Norway).

Basic material is fish-meal.

B.P. 683,964. Hair curlers and clamps. D. Hodkin. To: English Racing Automobiles Ltd., Sales Affiliates Ltd.

Clamp and container may be made in one moulding from nylon.

B.P. 683,999. Bread board or the like. D. J. Ferrier (Australia).

The board is moulded as a single unit from synthetic plastic material. Inverted, it may be used as a dish or salver.

B.P. 684,044. Door handles and the like. C. L. N. Laing, W. H. Boddington.

B.P. 684,085. Transparent surface finishes on wood, decorative laminates and other materials. To: American Cyanamid Co. (U.S.A.)

A melamine and/or urea-formaldehyde resin is used or a copolymer of styrene or diallyl phthalate and the reaction product of a polyhydroxy alcohol and a dicarboxylic acid.

B.P. 684,086. Stiff laminated sheet material. E.P. King.

The bond used is a synthetic resin.

B.P. 684,091. Manufacture of synthetic resins. A. Brookes, F. L. Hudson. To: British Industrial Plastics Ltd.

Water-soluble cationic condensation products of urea and formaldehyde for the treatment of cellulosic material are obtained in a certain way.

B.P. 684,093. Method of treatment of natural, or synthetic plastic bristles, and the products thereof. To: Soc. Electrochimica del Toce (Italy).

The bristles are subjected to a moving card wire band.

B.P. 684,105. Coated non-fibrous cellulosic sheet wrapping material. To: E. I. du Pont de Nemours and Co. (U.S.A.).

A base film of transparent cellulosic material is treated with a partially condensed guanidine-carbamide-aldehyde resin, thereafter coated with a conventional coating composition.

B.P. 684,154. Machines for injection moulding, transfer moulding or pressure casting. To: N. V. Philips' Gloeilampen-Fabrieken (Netherlands).

A movable mould part and an injector or transfer part are each associated with a double-acting piston. A constant and a varying pressure is used for moving the parts to inoperative and operative positions with automatic means for increased pressure from an independent source upon the parts during injection or transfer.

B.P. 684,161. Manufacture of ceramic articles. To: K.L.G. Sparking Plugs Ltd. Comm. from: C. M. Carington.

The mould for insulators is made from "Perspex" or "Catalin."

B.P. 684,179. Manufacture of pads for sole presses as used in the manufacture of footwear. F. G. Mercer. To: Lotus Ltd.

A covering of polythene is applied to a leather base in extruded form, subjected to pressure and heat and the composite covering allowed to cool below the melting point of the polythene while still under pressure.

B.P. 684,196. Method for applying distinctive marking to insulated electric conductors. G. H. Taylor, J. R. P. Willett. To: British Insulated Callenders Cables Ltd.

The method applies to polyethylene coverings. A polyethylene thread of a certain colour is lapped round the covering and passed through a heated region so that it sinks into the covering forming a thin helical line of distinctive colour.

B.P. 684,237. Method of producing composite material with a surface of hardened synthetic resin. J. Marlan (Sweden).

Urea-aldehyde resins are used.

B.P. 634,269. Spectacle frames. M. Wiseman and Co., Ltd., M. Wiseman.

B.P. 684,276. Closing means for pots, jars, bottles and the like containers. G. A. Kihm (France).

Polythene serves as packing and as temporary stopper if the metal cap is destroyed.

B.P. 684,334. Production of esters from solid acids or anhydrides. F. Dean, I.C.I., Ltd.

Colourless plasticizers for polyvinyl chloride are obtainable by employing pure and thermal stable alcohols and certain heating.

B.P. 684,335. Colour removal from esters. F. Dean, I.C.I., Ltd.

B.P. 684,350. Manufacture of wall and like boarding. P. O. Rosin. To: British Artificial Resin Co., Ltd.

A phenolic resin ("Cellobond" J.2304) or an aminoplastic resin ("Cellobond" U.8770) have proved suitable for the required heat treatment to reach maximum compressibility of the wood sawdust to be mixed with resin.

B.P. 684,365. Film materials. K. J. Challis, E.W. Lee. To: Ilford, Ltd.

The supporting sheet consists of a copolymer of vinyl chloride (vinylidene chloride) with vinyl acetate or an acrylate, a methyl methacrylate polymer thereon, and superimposed another methyl methacrylate polymer of a certain kind.

B.P. 684,392. Adhesive cement composition and composite structures employing said cement composition. J. M. McClellan, Jr. To: Minnesota Mining and Mfg. Co. (U.S.A.).

The sprayable composition comprises a rubbery chloroprene polymer, a phenol-aldehyde resin and an additional tackifier resin dissolved in a certain blend of volatile liquid hydrocarbon. It bonds permanently a plasticized polymeric strip to metal supports, or to leather, fabric, wood, glass.

B.P. 684,400. Coating, impregnating, or adhesively uniting articles with polyester compositions. O. B. Edgar, H. G. White, I.C.I., Ltd.

B.P. 684,402. Paper and like bags or containers. J. C. Arnold. Comm. from: Pneumatic Scale Corp., Ltd.

The bag-forming material has its exterior surface free from thermoplastic material. The top closure is made of a stripe of high melting (at least at 180° F.) thermosetting adhesive, bottom closure and side seam of a stripe effecting seal below 110° F.

B.P. 684,404. Antiseptic sheeting. W. Engel.

A bactericide is incorporated in the plastic mix of vinyl polymer or copolymer compounds.

B.P. 684,473. Rollers. Cables and Plastics, Ltd., H. S. Pilling.

A roller for printing, duplicating machines, leather tanning, typewriters, etc., is made with a metal core and an outer cover of polyvinyl chloride prepared in a certain way.

B.P. 684,476. Manufacture of polymers. F. Brown, K. C. Mulfitt. To: Dunlop Rubber Co., Ltd.

The polymerization relates to monoethylenic compounds containing the Group $CH_2=C<$.

B.P. 684,489. Process for the polymerization of vinyl compounds. Beck, Koller and Co. (England), Ltd., G. Swann, E. L. Humburger.

B.P. 684,499. Halogen-containing polymeric substances of improved heat and light stability, and stabilizers therefor. G. P. Mack. To: Advance Solvents and Chemical Corp.

B.P. 684,515. Process for the stabilization of vinyl halide polymers and the resulting stabilized polymers. To: N. V. de Bataafsche Petroleum Maatschappij. (U.S.A.)

A certain ester derived from a polycarboxylic acid and an unsaturated alcohol is incorporated. This gives an unexpected stability against deterioration by light.

B.P. 684,529. Manufacture of capacitors. R. A. Grouse. To: A. H. Hunt Ltd.

The strip dielectric assembly with a staggered pattern of metallized areas is impregnated with resins such as "Marco SB-28c" or "Araldite Resin B."

B.P. 684,582. Machine for the moulding of thermosetting and thermoplastic materials. J. W. Hendry. (U.S.A.)

Because of their different characteristics different machines were used. Thermoplastics were slowly heated and compressed by a screw, thermosetting materials were rapidly heated by electrical induction heaters. In the new machine, both types are treated to an extended period of preheating under careful temperature control. The machine works with 2,800 p.s.i. as against 20,000 to 30,000 p.s.i. exerted by the ram in previous types of machines.

B.P. 684,611. Method of and means for blow-moulding plastic material. R. Pollak. To: T.H.P. (London) Ltd.

A bag-like preform is moulded round a core and passed, still on the core, to a blow-moulding die where it is blown to final shape. Moulding and blowing occurs simultaneously on separate articles with all three stages in sequence on one machine.

B.P. 684,651. Process for moulding synthetic linear polyesters. J. A. Piccard. To: E. I. du Pont de Nemours and Co.

Sound recordings are accurately reproduced by mouldings of polyethylene terephthalate. The process does not require cooling of the closed mould.

B.P. 684, 674. Adhesive compositions. B. J. Balfe, I.C.I. Ltd.

Heat activatable compositions, e.g., for the shoe industry, comprise a rubbery copolymer of butadiene and acrylonitrile and a copolymer of vinylidene chloride and acrylonitride in solution in organic solvent. The non-tacky film applied to leather is activated by radiant heat.

B.P. 684,678. Production of shaped articles. To: Lonza Elektrizitaetswerke und Chemische Fabriken A.G. (Switzerland).

Polyvinyl chloride is mixed with mono-isocyanates. The shaped articles show improved hardness and softening point, obtained by allowing the articles to age.

B.P. 684,691. Ash trays. British European Airways Corp., A. H. Pooley.

B.P. 684,699. Production of linear poly-hydrazides. To: Celanese Corp. (U.S.A.)

B.P. 684,708. Production of suedette sheet material. E. W. Madge, K. G. Barridge. To: Dunlop Rubber Co. Ltd.

Textile fibres are distributed over a backing sheet of a polymer or copolymer of vinyl chloride and a plasticizer convertible by heat to a porous gel.

B.P. 684,719. Tops of cycle saddles. H. R. Bleksley. To: J. B. Brooks and Co. Ltd.

B.P. 684,720. Clothes-hanger. S. H. Tan (Netherlands).

B.P. 684,760. Removable closures. F. A. Foxon. To: National Research Development Corp.

The closures are intended for high-voltage discharge tubes preferably of laminated fibrous material bonded with "Paxolin" or "Tufnol."

B.P. 684,764. Magnetic coating material adapted to be applied to sheet material and magnetic recording sheet material made therefrom. M. G. Hegdal. To: Minnesota Mining and Mfg. Co. (U.S.A.).

The binder for the flexible supporting web and the ferromagnetic particles is a composition which includes acrylates.

B.P. 684,852. Process for the purification of lower aliphatic aldehydes. J. C. Walker, B. O. Heston. To: Cities Service Oil Co.

In the manufacture of phenol-formaldehyde resins or melamine-formaldehyde resins odorous impurities become sharply noticeable in the resin-forming reaction. A solvent extraction process is described to improve odour and to reduce acidity.

B.P. 684,860. Alcohol reacted phenol-formaldehyde bonding resins and bonded laminates of aluminium and cellulosic sheet material. To: Union Carbide and Carbon Corp. (U.S.A.).

B.P. 684,863. Machine and method for making hollow articles. E. E. Mills (U.S.A.).

Bottles are made from thermoplastic tubing discharged from an extrusion machine on to a circular rotary table with moulds arranged in a circle. The table is rotated clockwise, synchronized with and away from the output end of the extrusion machine. The plastic tube is compressed between the lower and upper half of the next mould, the lower end of a hollow needle pierces the wall of the tube and a fluid forced through the needle into the sealed interior expands the tube against the inner walls of the mould.

B.P. 684,878. Production of gas-expanded organic plastics. To: U.S. Rubber Co. (U.S.A.).

A mixture of urea and oxalic acid (urea in excess) is mixed with an expandable organo-plastic material. Urea and acid are then decomposed by heat to evolve gas.

B.P. 684,883. Razor-blade holder. P. Muller (Germany).

Blades lie overlapped in echelon in a holder (plastic moulding).

B.P. 684,910. Process for the after-treatment of frosted glass surfaces. To: Deutsche Libbey-Owens-Ges. A.G. (Germany).

Cavities, cracks, etc., resulting from the frosting process are filled with translucent natural or synthetic resins or plastics.

B.P. 684,952. Production of hollow panels from webs of fibrous material. G. Steffenino (Italy).

Webs and ribs are formed from plywood, cardboard linen, Cellophane impregnated with thermosetting or thermoplastic synthetic resin.

B.P. 684,970. Magnetic recording media. To: Minnesota Mining and Mfg. Co. (U.S.A.).

A magnetic coating is bonded to a thin, flexible cellulose acetate film. The binder in the magnetic coating is a blend of a copolymer of 90 parts vinyl chloride and 10 parts vinyl acetate (80 parts) and a copolymer of 65 parts butadiene and 35 parts acrylonitrile (20 parts) in which magnetic iron oxide pigment is uniformly dispersed.

B.P. 684,976. Polythene compositions. W. J. S. Naunton, W. R. Prior, J. R. S. Waring. To: I.C.I., Ltd.

Nickel dibutyldithiocarbamate is incorporated (0.5 to 5%).

B.P. 685,011. Combined combs and brushes. S. D. Rand.

B.P. 685,016. Preparation of copolymers of vinylidene cyanide with another monomer. H. Gilbert, F. F. Miller, V. L. Folt. To: B. F. Goodrich Co. (U.S.A.).

Vinylidene cyanide and acrylonitrile are mixed in the presence of a peroxygen catalyst.

B.P. 685,035. Agitating device, particularly for use in the manufacture of thermoplastic polymerized resins. To: S.A. des Manufactures des Glaces et Produits Chimiques de Saint Gobain, Chauny and Cirey.

Bars rotating in a chamber operate partly at the periphery, partly in the central zone at such an inclination that the outer part of the contents is driven towards the centre, the inner part towards the periphery.

B.P. 685,038. Manufacture of patterned thermoplastic strip material formed of differently coloured stripes. J. F. Kenure. To: Duratube and Wire Ltd.

The cords coming from a horizontal row of separate extrusion orifices meet an obstruction causing the hot plastic material to spread laterally so that they coalesce.

B.P. 685,048. Coating compositions and materials coated therewith. G. R. Barrett. To: Monsanto Chemical Co. (U.S.A.).

B.P. 685,077. Process for the manufacture of filaments, threads, artificial horse-hairs, straws and similar filamentary articles from polymers of vinyl chloride. To: Soc. Rodiaceta (France).

B.P. 685,090. Process for curing halo-sulphonated hydrocarbon polymers. To: E. I. du Pont de Nemours (U.S.A.).

The polymer is a chlorsulphonated polythene.

B.P. 685,099. Battery separator. To: Oldham and Son Ltd. (U.S.A.).

Additional resin is applied to the ribs so that in finally cured state the ribs are impermeable while the electrolyte can pass the areas between the ribs.

B.P. 685,163. Pourers for carboys and like vessels. To: Harry Heymann Ltd. Comm. from: C. E. and K. Peters.

"Igelit" is used for the cap with spout and air tube to be mounted over the neck of the vessel.

B.P. 685,280. Optical Viewing apparatus. A. M. Horta.

The spy-glass to be fixed in a hole in a door (partition, wall) may be made of a transparent synthetic resin (cover tab excepted).

B.P. 685,364. Plastic extruding machines or appliances. David Bridge and Co. Ltd., J. Brown.

In many instances (particularly when extruding rubber) pre-working or passing through two extruding machines in series is required to obtain sufficient plasticizing. An open-ended rifled cylinder with a feed hopper on one end, an extruding nozzle at the other end, a scroll inside extending into the cylinder bearings and means for rotating cylinder and scroll at different speeds gives improved plasticizing action.

B.P. 685,379. Package. To: Wingfoot Corp. (U.S.A.).

A pouch for peanut butter is made from i.a. copolymer of vinyl chloride, polyethylene or the like with a resilient stiffener keeping the narrow mouth closed when no pressure is applied on the pouch.

B.P. 685,381. Compositions comprising Polyethylene. To: B.B. Chemical Co. Ltd. (U.S.A.).

An adhesive composition stable at room temperature is obtained from polyethylene mixed with butyl rubber, worked at a temperature near the softening point of polyethylene, worked again below that temperature and dissolved in an organic solvent.

B.P. 685,386. New compositions of matter and shaped articles produced therefrom. C. S. Marvel. To: E. I. du Pont de Nemours and Co. (U.S.A.).

A polymer of acrylonitrile is dissolved in N, N-dimethylacetamide. The material may serve for auto-tops, balloon fabric, lifebelts, numerous other purposes.

B.P. 685,395. Process of manufacture for reflex-reflecting materials. E. O. L. M. Delpierre (Belgium).

To a flexible metal sheet whose surface has been brushed with a metal brush and very fine, hard abrasive to form microscopic asperities, plastic spheres are affixed by adhesive.

B.P. 685,449. Production of resinous compositions. A. A. K. Whitehouse. To: Bakelite Ltd.

Rods, laminated products are made from certain ethylenic compounds and unsaturated alkyl resins formed, e.g., by considering a mixture of dibasic acid and mixed glycols with or without a catalyst.

B.P. 685,457. Agricultural cloches. T. F. N. Alexander, A. P. W. Simon.

"Vimlite," a flexible plastic material incorporating a metallic or plastic grid, is used in long lengths rolled off by a special machine in two sheets with their upper edges close together over staples as in the usual glass cloches.

B.P. 685,486. Method of marking containers, panels, and other articles constructed from sheet material. D. Jackson. To: Pye Ltd.

Transparent windows with the marking showing strips applied to the back are inserted in apertures of the metal sheets. The windows are punched out of cellulose acetate or "Perspex" of the same thickness as the metal sheet.

B.P. 685,566. Fishing line. W. R. Wadsworth.

A coating is applied of a polymer or copolymer of vinyl chloride, vinyl acetate, vinyl nitrile or such like material, preferably in several layers.

B.P. 685,649. Process for the preparation of polyesters, the polyesters so prepared and plastic compositions containing the polyesters. To: N.V. de Bataafsche Petroleum Maatschappij (U.S.A.).

The polyesters are derived from succinic acid. Resins which may be plasticized with these polyesters include urea-aldehyde and melamine-aldehyde type resins. Resistance to water, tensile strength, resistance to outdoor exposure are enhanced.

B.P. 685,660. Savings container. H. Sora (Switzerland).

B.P. 685,729. Production of polyurethanes. To: Celanese Corp. (U.S.A.).

B.P. 685,759. Contact lenses and blanks therefor. A. Abbey. Comm. from: American Optical Co.

Polystyrene, polycyclohexyl methacrylate and, preferably, polymeric methyl methacrylate may be employed. The wall portion is adapted to shrink and to accommodate itself to the shape of the scleral portion of the eye, while the central optic portion is spaced from the wearer's eye.

B.P. 685,797. Treatment of defective metal castings. P. J. Young. To: Industrial Impregnations Ltd.

Blowholes or similar cavities are filled with a mix of powdered metal (90%) and a resin solution containing a high (95%) proportion of a thermosetting resin (alcoholic solution of phenolformaldehyde). The casting is heated to such a temperature (150° C.) as to ensure final curing of the resin.

B.P. 685,838. Production of paste-forming polyvinyl chloride. Distillers Co. Ltd., C. E. Hollis, H. M. Hutchinson, K. H. C. Bessant, A. G. Goodchild, S. G. Kemp.

Paste-forming p.v.c. may be obtained directly by adjusting the polymerization conditions to be intermediate between emulsion and dispersion polymerization.

B.P. 685,844. Thermoplastic synthetic resins. M. Kaufman, A. F. Williams. To: C. D. Patents Ltd.

Emulsion polymerization is used for resins derived from co-polymeric thermoplastic resins in which acenaphthylene is one of the monomers.

B.P. 685,851. Thermoplastic compositions. W. Saul, E. Sharp. To: Semtex Ltd.

Wall facings, flooring and other surfaces are made more resistant by including a plasticized polyvinyl resin in the binder of coumarone resins and a gelled vegetable oil with fibrous and non-fibrous fillers.

B.P. 685,906. Moulding sponge rubber articles. J. A. Howard, J. A. Talalay (U.S.A.).

B.P. 685,911. Process for the production of artificial fibres. D. Horsak (Czechoslovakia).

A small quantity of a thick or semi-solid fibre-forming mass is applied to a rotating drum. A rotating comb picks up periodically a great number of simultaneously formed fibres.

B.P. 685,933. Resins derived from aldehyde and natural resins. A. Canouet. To: Vitex S. A. Anciens Ets., J. Canouet.

Crude gum is condensed with an aldehyde in the presence of a di-carboxylic acid or an anhydride thereof.

B.P. 685,950. Process and apparatus for the production of artificial fibres. D. Horsak (Vyzhummy Podnik Drahomira Horsak). (Czechoslovakia).

B.P. 685,998. Lavatory seat. A. B. Bloomfield, I. I. Bloomfield.

The cover hinged to, and embracing the inner and outer edges of, the seat includes a recess for disinfectant.

B.P. 686,010. Injection moulding apparatus. Dunlop Rubber Co. Ltd., J. M. Love.

The delivery of mouldable material (by an extruding screw) is regulated by a pressure sensitive electric switch independent of movement between mould halves.

B.P. 686,020. Devices for holding and dispensing liquid or semi-liquid substances. L. Lempert.

For mustard, cosmetics, medical preparations. The stopper has a spatula dipping into the contents.

IMPROVING QUALITY OF PLASTICS MOULDINGS

(*Continued from p. 223*)

If the drawings of such a proposed component are unsatisfactory, or give insufficient information, or specifications are ambiguous and difficult to understand, the moulder may be placed in considerable doubt, uncertainty and misconception about what exactly is required, particularly if little indication is offered to him as to the directions in which it is permissible to depart from the drawing or specification.

If at this stage, there is no direct liaison and understanding between user and moulder, the latter may have no alternative but to exercise his own discretion on the points in doubt, and generally work to those forms or scale of precision he has found offer best facilities for economical reproduction. Thus his standards of accuracy, finish and general quality, whilst giving an apparently satisfactory article based on his unaided and defective interpretation of needs, may not be in accord with what the user has in mind.

As most moulders will be aware from personal experiences of the above kind, the outcome is often drastic alterations to a mould or other tools, serious departure from the original component forms, with added costs and dissatisfaction or acute disappointment for both parties.

A Questionnaire

One excellent plan for achieving practical user-moulder liaison is comparatively simple and inexpensive to operate and can be applied by large or small moulding companies, since it involves the minimum amount of paper work, which is often regarded as a bugbear in the small works. The great advantage of this plan is that the moulder to some extent takes the initiative in requesting the sort of information he needs to facilitate his estimating and mould-design, etc., and thus is far better assured of obtaining all the relevant information. Moreover, it ensures that this information will be obtained before the mould designer makes the preliminary draft lay-out of the necessary mould design, or other tools, upon which a cost and price estimation can only be based.

The plan comprises the issue of a memorandum drawn up in the form of a printed or duplicated questionnaire, which the moulder supplies to the user in response to any inquiry, or to those which are found to be deficient in instructions as to what is required.

An example of such a questionnaire is shown on page 223.

The questionnaire may be duplicated or printed where the number of inquiries are large. The latter will probably prove the most convenient apart from questions of cost, in that the style may be more easily varied from time to time as circumstances demand.

Receipt of a completed questionnaire from the client will normally enable the moulder to make all the necessary estimations, of materials, mould design, tooling costs, best production method, weight of article, etc., so that a reliable price quotation can be drawn up.

The greatest advantage of all, will be that the moulder will have most sources of doubt removed, especially those concerning his interpretation of shape, forms and features. With complex mouldings, such as now abound for industrial purposes and duties this will be a most valuable help for the moulder and user.

The sight of such a questionnaire will also serve admirably for guiding the prospective user on future occasions when new projects are contemplated as to the correctness or suitability of any specific feature under consideration.

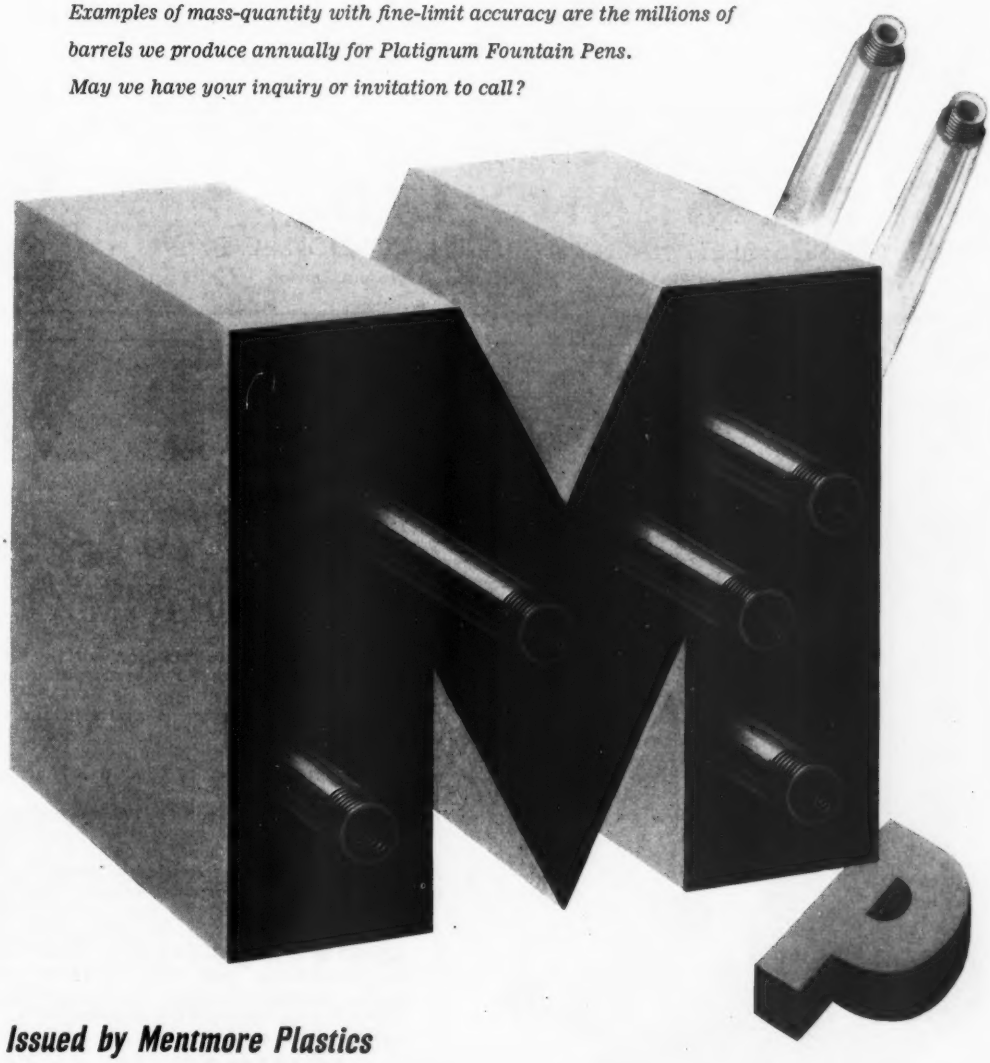
(*To be continued*)

perhaps we should explain . . .

. . . precisely what Mentmore Plastics have to offer that you need and do not usually find : what there is about our thermo-plastic injection mouldings service that is a step or two ahead of the field :

Delivery Service: *Count on this to be absolutely exceptional. We promise you the best timetable in the Plastics business — and keep to it (which is, perhaps, more surprising). Just ask us to prove it.*

Meticulous Accuracy: *We welcome orders for intricate mouldings and guarantee accuracy in all our production. However close the limits imposed we will work to them. Examples of mass-quantity with fine-limit accuracy are the millions of barrels we produce annually for Platignum Fountain Pens. May we have your inquiry or invitation to call?*



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APM

HAND OPERATED BENCH INJECTION MOULDING MACHINE

★ **The A.P.M. machine is suitable for working all thermoplastics such as Cellulose Acetate, Polystyrene, Alkathene, etc.**

★ **A complete mould service is available and standard mould blanks are supplied.**

★ **Maximum moulding capacity 2/3rds oz. (19 grms.) per injection.**

★ **Attainable production rate up to 100 injections per hour depending on mould design.**

★ **A Hopper giving semi-automatic feed control and a thermometer for heat control are incorporated in this Model.**

A LOW-PRICED VERSATILE MACHINE FACILITATING THE PRODUCTION OF PLASTIC MOULDINGS IN SMALL OR LARGE QUANTITIES

ASMIDAR PLASTIC MOULDING MACHINES LTD.

See this versatile moulding machine on Stand No. A.19(d)

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Prompt delivery of Synthite tested Formaldehyde depends on good team work; efficient production at the Synthite factories—careful routing and control of the tanker fleet at executive level—and, finally, the enthusiasm and skill of the crews who drive our giant tankers through all weathers to every part of Great Britain.

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40% by Volume

Free from Deleterious Matter

SYNTHITE
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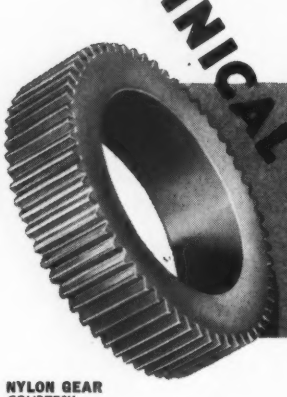

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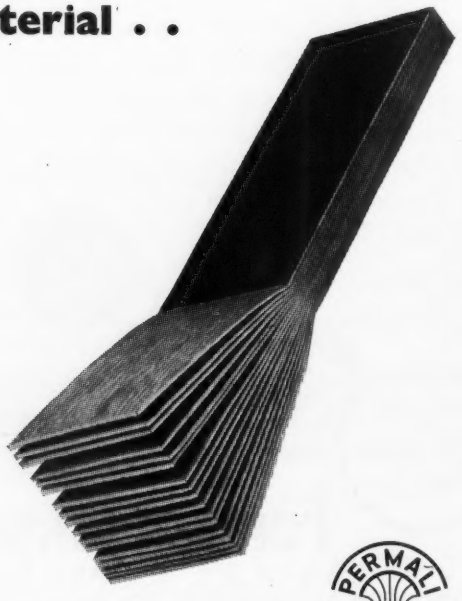

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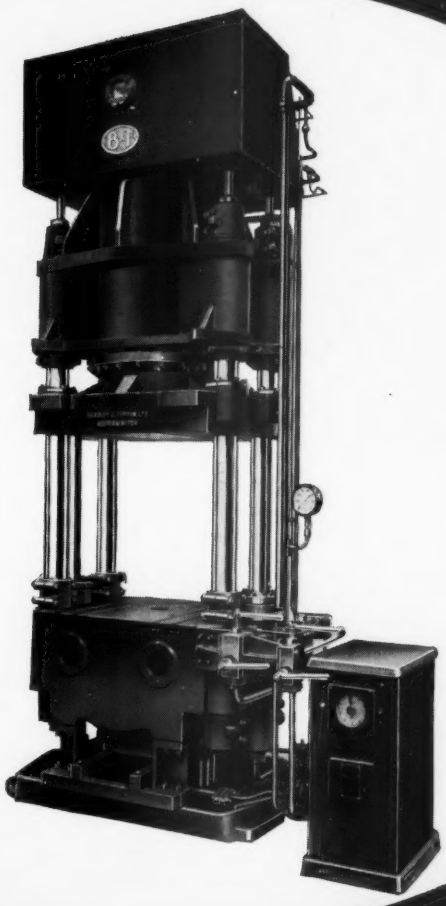

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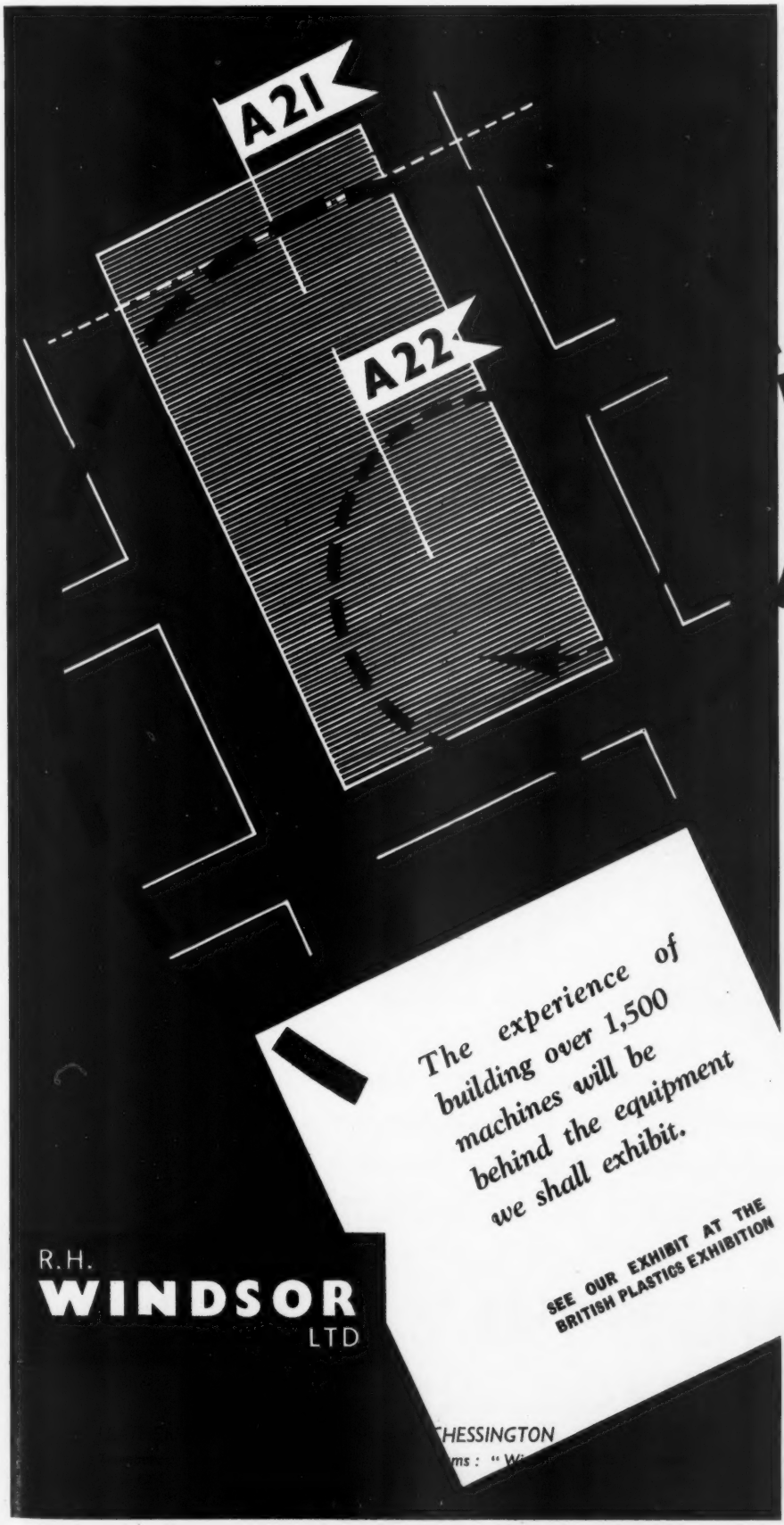

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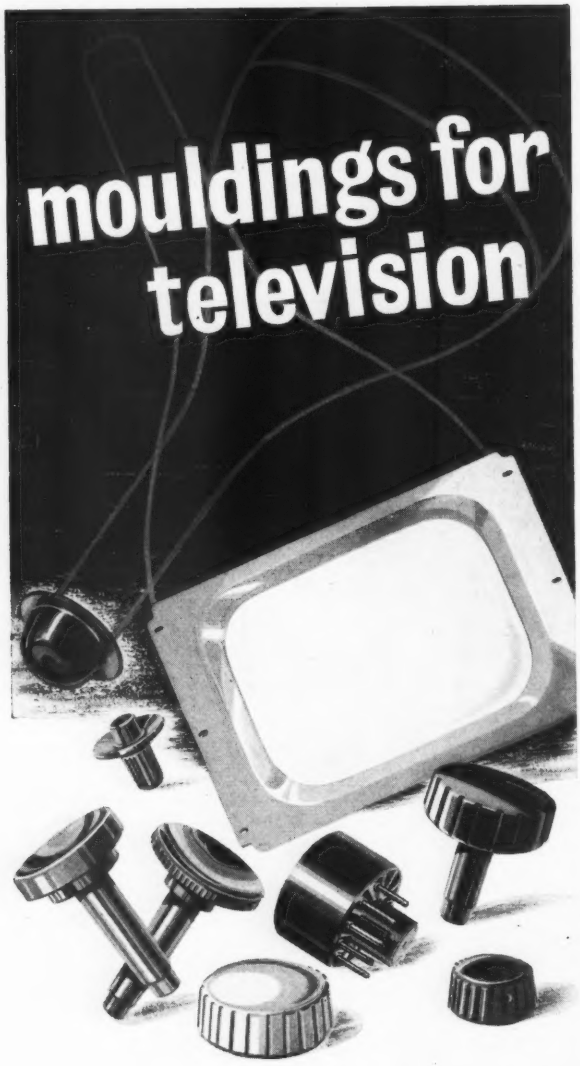
See our other announcement on page 76



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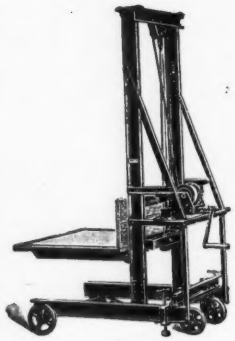

Capacity from 1 cwt. to 1 ton—Normal Lifting Heights from 4 ft. to 12 ft. Platforms from 2′ 0″ x 2′ 0″ to 4′ 0″ x 4′ 0″, or with Forks for Palletts.

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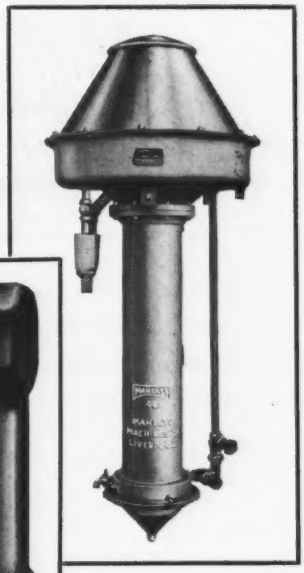
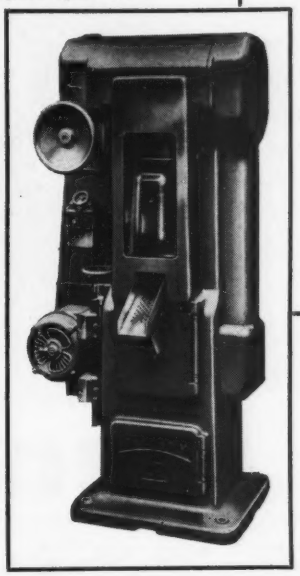


Right: The Manesty 4B Automatic Water Still. Steam heated. Output: 50 gallons per hour.



Left: The new Manesty 3A Preforming Press. Single or multi-punch. Variable speed drive. Output: 16/256 pellets per minute. Max. diam. 2¼".

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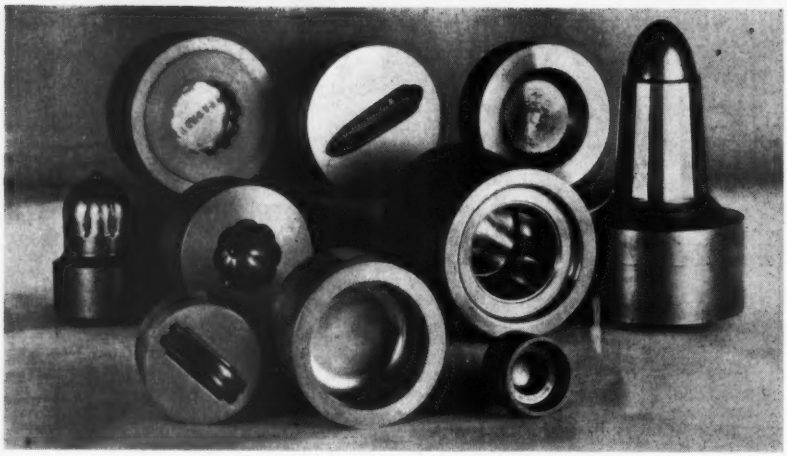

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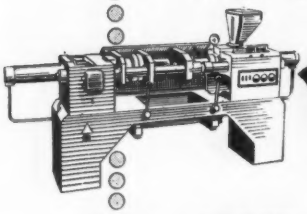

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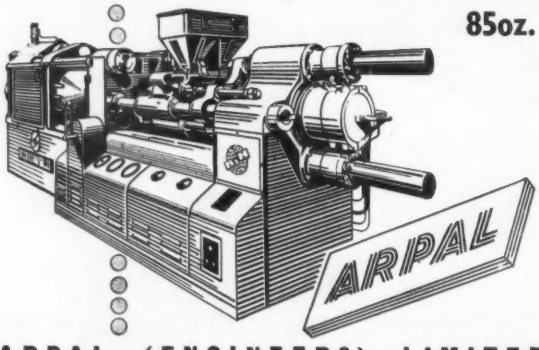

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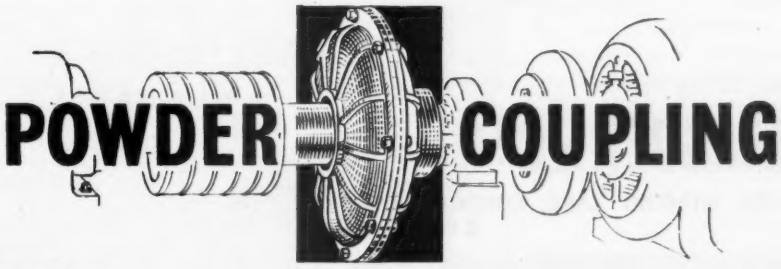

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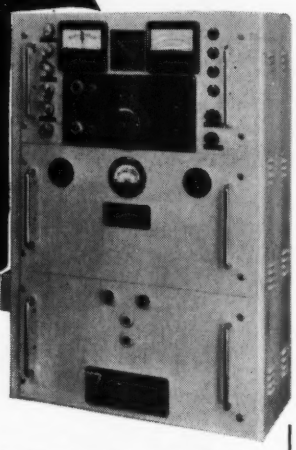

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The thickness and the deviation from a pre-set thickness are both indicated and there is no contact with the material.

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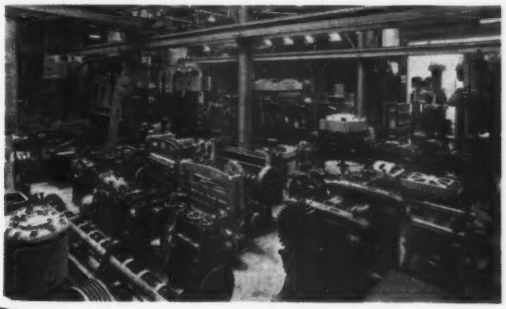

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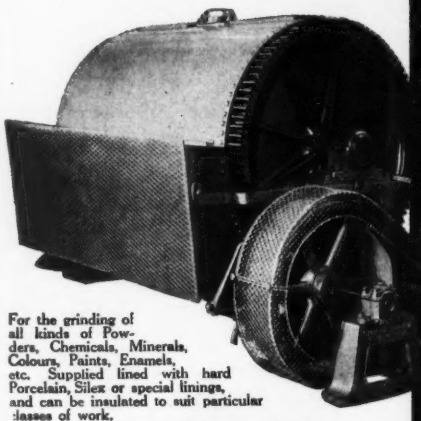

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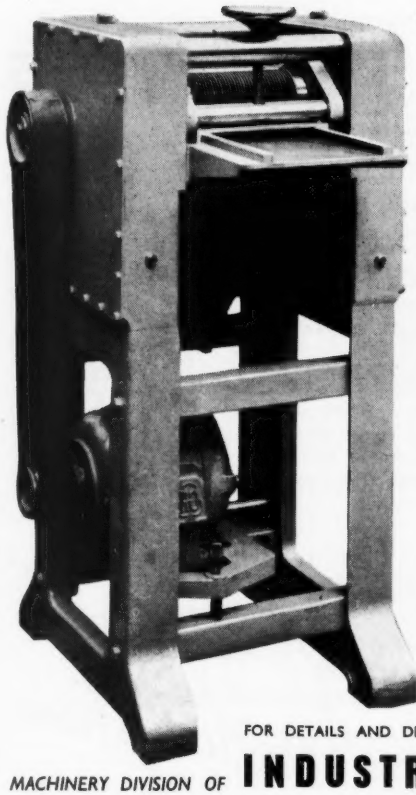

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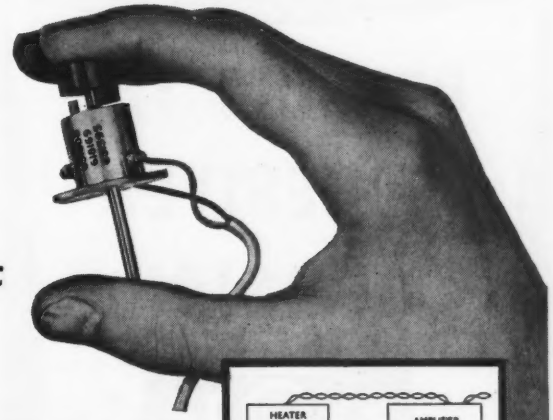

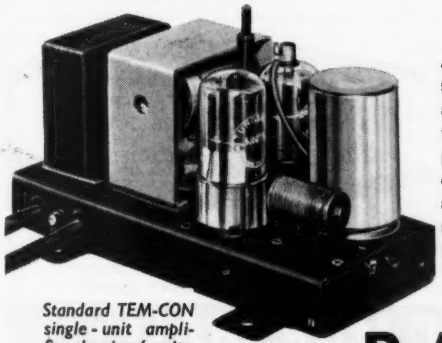

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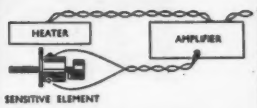

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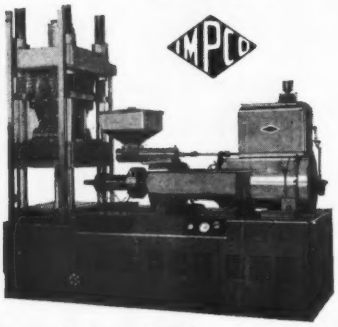

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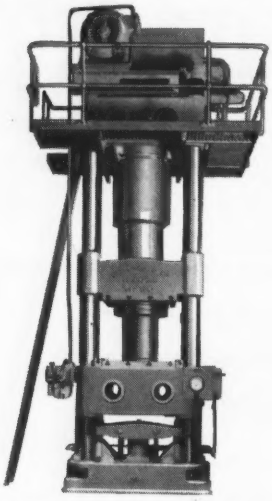

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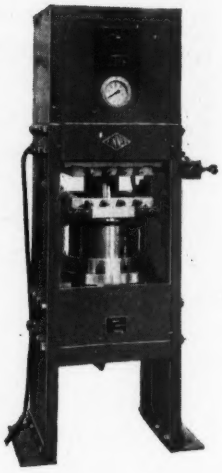

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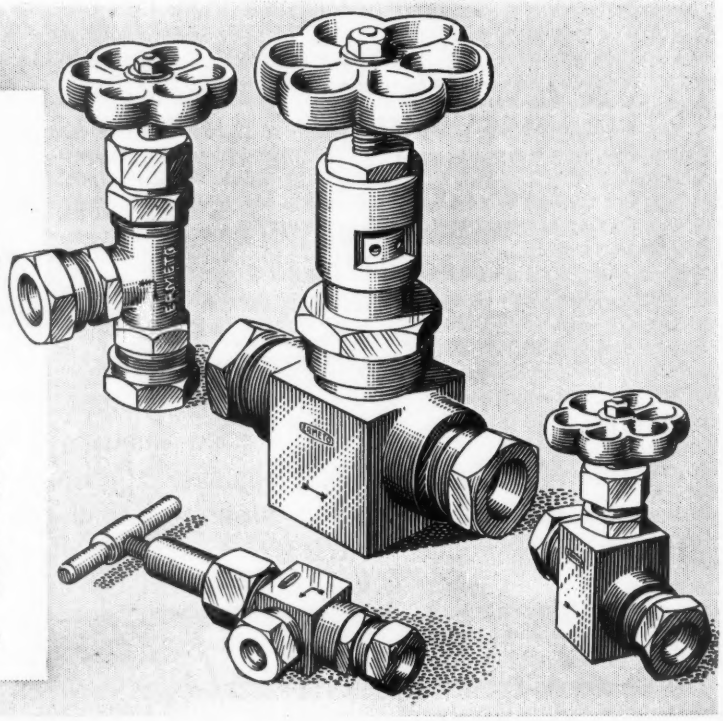

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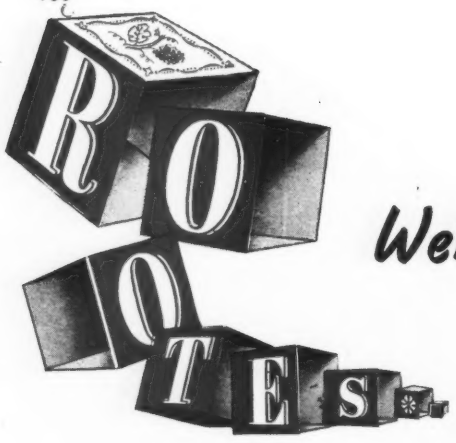

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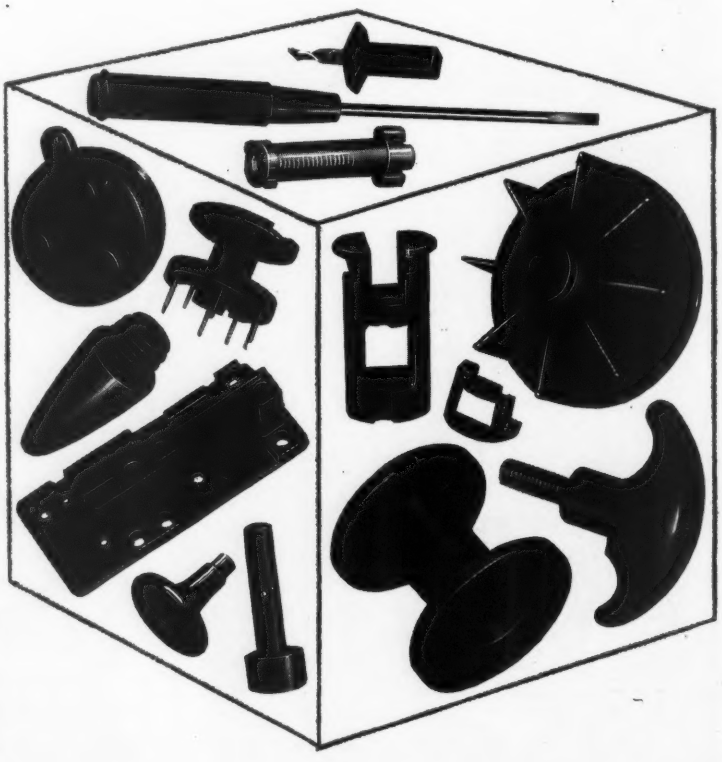

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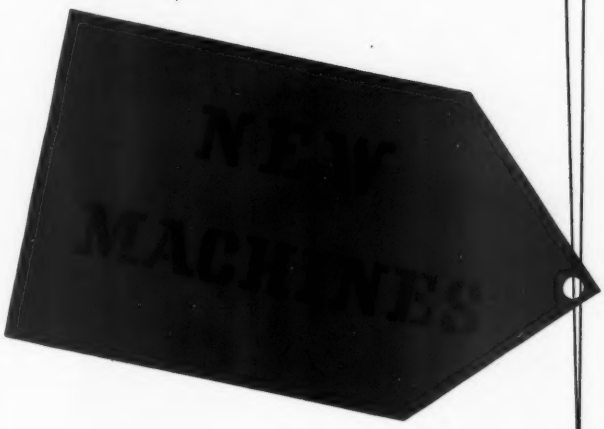

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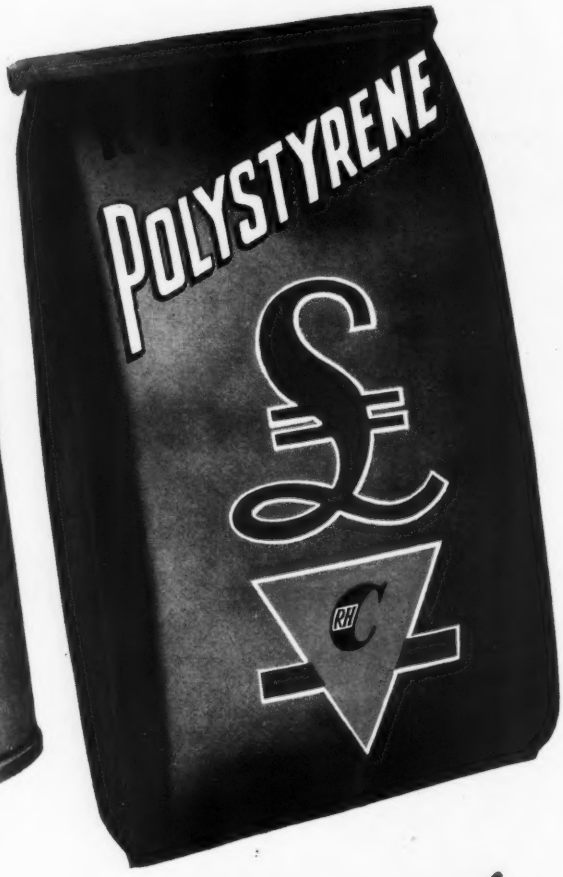

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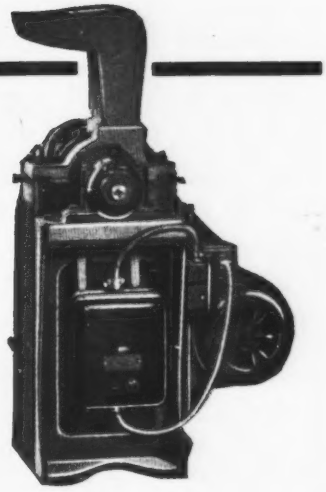

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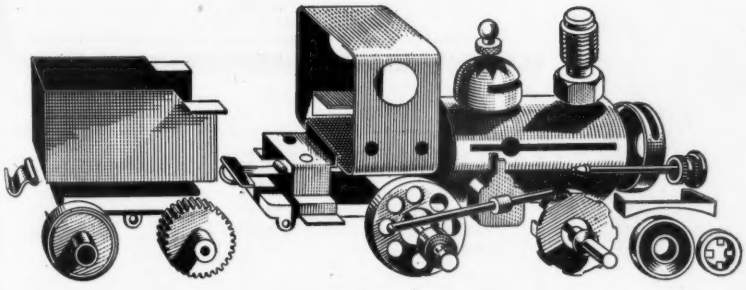

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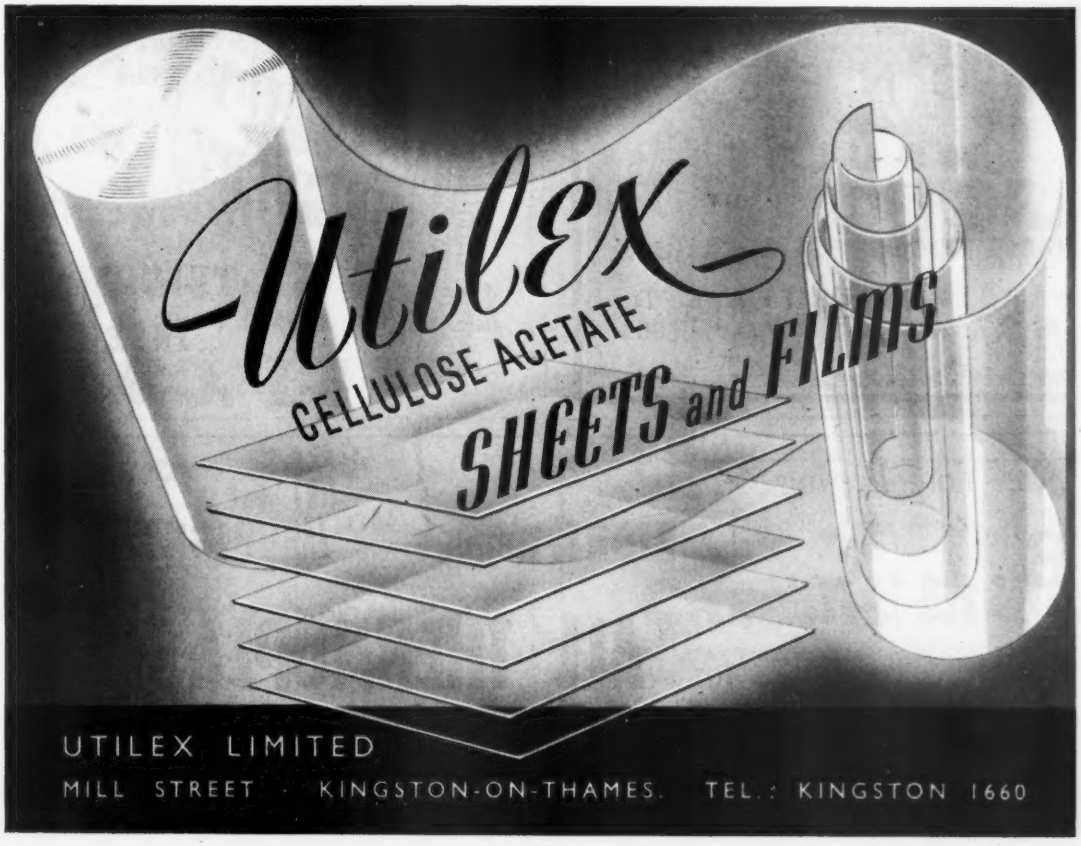

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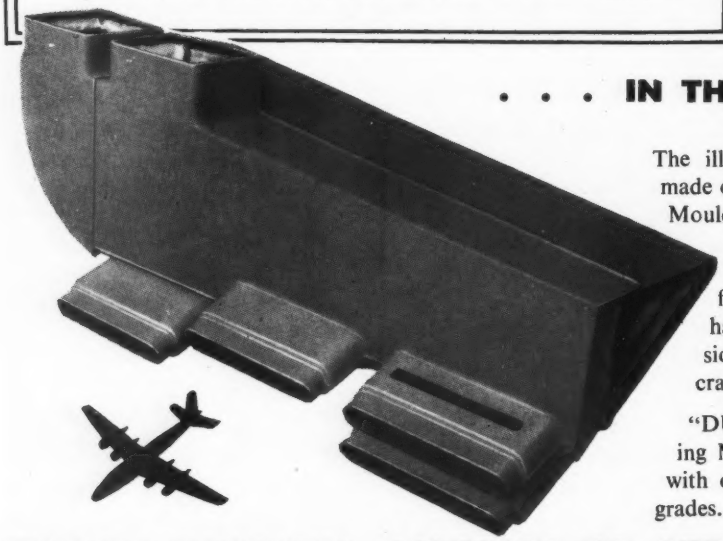

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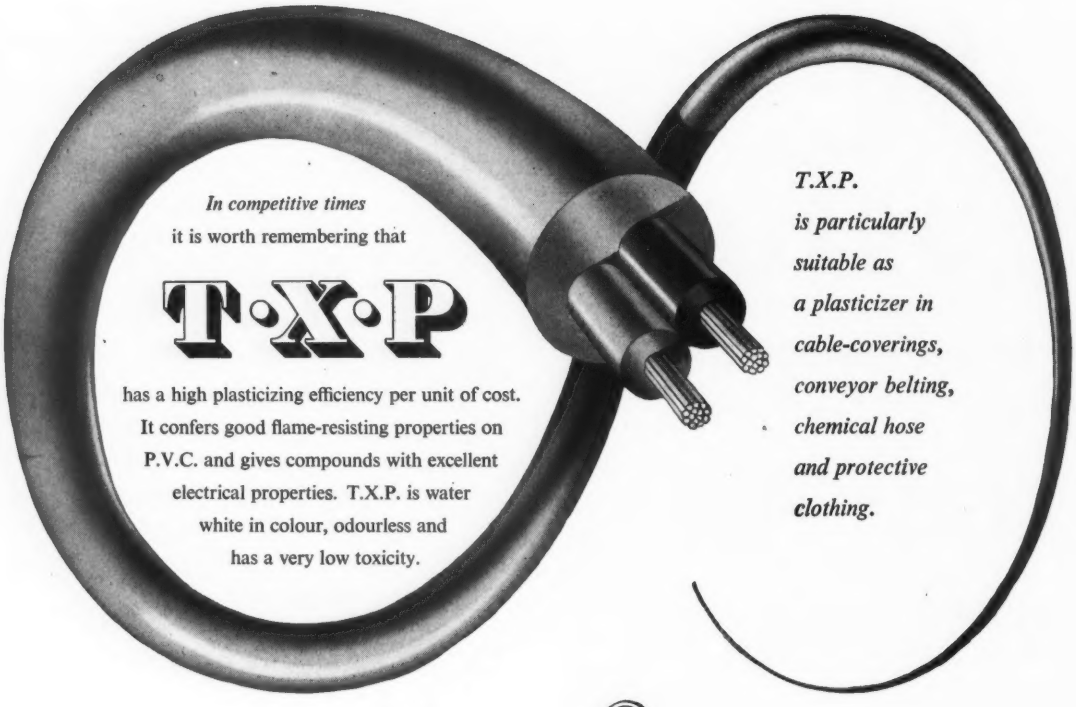

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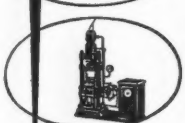

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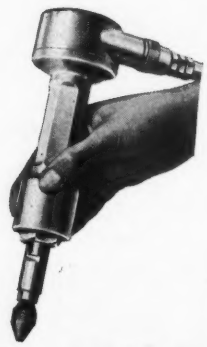

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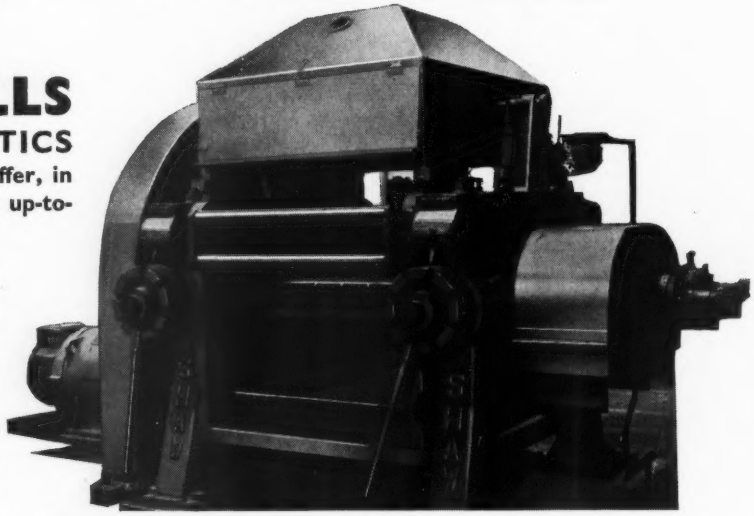

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REDUNDANT PLANT. Plastic moulding press, Daniels or Bradley and Turton, 250-ton D.S., 20-in. stroke, platens 30 in. by 30 in., 1-ton working pressure with one new 3.5-kW Ferranti H.F. pre-heater, electrode plates 19 in. by 20 in. Apply G. J. Shaffer, 120 Cricklewood Lane, N.W.2. Phone, Euston 6687. 191-6

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Machinery, Tools and Plant (contd.)

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Two 250-ton upstroke presses by Henry Berry, 15-in. dia. ram by 20-in. stroke, four columns, 2 ft. by 1 ft. between, table area 24 in. by 22 in., daylight 20 in., W.P. 1½ tons sq. in.

200-ton vertical D.A.-type press by Hydraulic Eng. Co., two-piston type D.A. 10⅛-10¼-in. dia. ram by 15-in. stroke, four columns, 25 in. by 15 in. between, top and bottom tables each 25 in. by 31 in., daylight 3 ft. closing to 6 in., W.P. 4,500 lb. sq. in.

200-ton upstroke press by Iddon, 10¾-in. dia. ram by 18-in. stroke, four columns, 2 ft. 5½ in. by 10¼ in. between, table area 27 in. by 25 in., daylight 18 in., W.P. 5,000 lb. sq. in., fitted two electric platens each 26-in. square, daylight between platens 12½ in.

200-ton downstroke press by Hydraulic Eng. Co., D.A.-piston type ram 11-in. dia. by 9⅝-in. rod by 12-in. stroke, fabricated frame, table area 30 in. by 21 in., daylight 28 in., transfer ram D.A.-piston type 6¾-in. dia. by 6¼-in. rod by 8-in. stroke, two ejector rams 2-in. dia. by 1⅜-in. rod by 7½-in. stroke, main drawback power 42 tons, transfer ram 70 tons, drawback 10 tons, ejector rams 2½ tons total, drawback 4½ tons, self-contained pump and motor.

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100-ton downstroke press by Bradley and Turton, 10½-in. dia. ram and two 1¾-in. side pushbacks by 15-in. stroke, four columns, 20½ in. by 10⅜ in. between, table area 21½ in. by 20¼ in., daylight 39 in., pre-fil tank and valve, below table pair ejector rams 2⅜-in. dia. and centre return ram, W.P. 1¼ tons sq. in.

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ACETATE SHEETING for disposal: approx. 1½ tons 20/1000-in. various colours, approx. 1 ton 4 mm. flesh, approx. 2 tons 3 mm. clear, approx. 3 tons 5 mm. clear, approx. 1 ton 4 mm. black, smoky 60/1000-in. and 40/1000-in. Please inquire Box P9121, care of " Plastics." 191-35

RAW MATERIAL WANTED

WANTED, Polythene scrap. Write to Box P7416, care of " Plastics." zzz-0322

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WANTED. Perspex clear offcuts, minimum width 3 in., any amount, any thickness, paper covered. Invicta Plastics, Ltd., Queens Rd., Leicester. Phone 78935. 193-1012

SITUATIONS VACANT

The engagement of persons answering advertisements in respect of vacant situations must be made through a local office of the Ministry of Labour, or a scheduled employment agency if the applicant is a man between the ages of 18 and 64 inclusive or a woman between the ages of 18 and 59 inclusive, unless he or she, or the employment, is excepted from the provisions of Notification of Vacancies Order, 1952.

PLANNING AND LAYOUTS ENGINEER with knowledge of plastic sheet fabrication, salary according to age and experience, prospects good. Box P912, care of " Plastics." 191-15

LEADING AMERICAN plastic moulders and fabricators require first-class development engineer with up-to-date knowledge of thermo-plastics. Advertiser will be in England shortly to interview candidates, who should write full details to Box P9114, care of "Plastics." 191-18

CABLE DEVELOPMENT ENGINEER, versed in modern shop practice and experience, required by rubber and plastic cable makers, medium types. Full particulars, age, experience and emoluments required. Apply Box P9110, care of " Plastics." 191-21

A VACANCY EXISTS with an established firm of thermoplastics and raw material manufacturers for a young man experienced in the preparation of p.v.c. compounds, to carry out experimental work on their properties and on the formulation of special compositions, N.E. area, permanent position, good prospects, house available. Write in confidence stating salary required and experience to Box P919, care of " Plastics." 191-22

REPRESENTATIVE required by trade injection moulders in London area, technical knowledge an advantage but not essential, age 25-40, salary and commission. Please submit full particulars of experience and education to Box P916, care of " Plastics." 191-25

COLOUR TECHNICIAN with experience of p.v.c. compounding required to take charge of new compounding section in calendering plant of leading manufacturers S.E. London, excellent prospects. Box P913, care of " Plastics." 191-28

GENERAL MANAGER required to take complete charge of an established plastic moulding company, compression and injection. State previous experience and salary required to Box P9118, care of " Plastics." 191-30

TOOL DESIGNER DRAUGHTSMAN required by compression and injection moulders, who would eventually take control of toolroom output. Apply Box P9116, care of " Plastics." 191-31

WANTED—Young man Inter B.Sc. standard, to work on development of resin/glass structures. Some knowledge of polyester resins an advantage. Canteen and sports club, pension scheme. Apply Box P9125, care of " Plastics." 191-38

Situations Vacant (contd.)

UNITED EBONITE AND LORIVAL, LTD., of Little Lever, near Bolton, Lancs, have a vacancy for an additional development technologist in their thermoplastic extrusion department. Applicants must have had practical experience on thermoplastic extrusions. Non-contributary pension scheme. Apply giving full details to Personnel Manager. 191-1

EXPERIENCED DRAUGHTSMAN OR ENGINEER required for press tool costing and estimating. Progressive position offered to the right man. Apply to Personnel Manager, Plastics Division, Universal Metal Products, Ltd., Pendleton, Salford, 6, Lancs. 191-3

SALES ASSISTANT required by industrial division of leading plastic moulders. Should have good general knowledge of plastic industry, and be qualified for advancement to managerial status. Appointment will in the first place involve internal work in sales office, but every opportunity will be offered to suitable applicant for advancement. Apply giving full particulars of age, experience and salary required to Halex, Ltd., Highams Park, London, E.4. 191-7

A MODERN AND WELL-EQUIPPED PLASTICS FACTORY near N.E. coast is expanding its research and development department, and has vacancies for (1) chemist with good Honours Degree or expecting to qualify shortly; (2) chemical engineer or plastics technologist. A few years' experience is an advantage but is not essential. Excellent opportunity for work on interesting new developments. Salary according to age and experience. Thomas De La Rue and Co., Ltd., West Chirton, North Shields, Northumberland. 191-9

A VACANCY EXISTS for a technical sales engineer operating from London to be trained in the use of plastic materials for extrusion, injection and calendering. Age 22-25. Write stating qualifications, experience and salary required to Office Manager, Bakelite, Ltd., 12-18 Grosvenor Gardens, S.W.1. 191-11

EXTRUSION-PVC AND POLYTHENE CABLES. Foreman wanted possessing full technical knowledge, long experience and drive. Small modern shop, good opportunity and wages for first-rate man. State age, qualifications, previous jobs, salary to " E.C.C.", care of Dixons, 1-9 Hills Place, Oxford St., London, W.1. zzz-454

WORKING FOREMAN required for extrusion of p.v.c. and polythene in factory in South Africa. Full details of experience to Arlington Plastics Development, Ltd., Barrrett's Grove, London, N.16. 192-1009

IMPORTANT AMERICAN FIRM wishes to contact model makers and designers experienced in the thermoplastic industry, preferably with knowledge of toy and fancy goods industries. Successful applicants will be interviewed in England shortly and should write giving full details to Box P9113, care of " Plastics." 191-17

GENERAL MANAGER with technical and commercial experience to take charge of established moulders, injection and compression, state previous experience and salary required. Box P9123, care of " Plastics." 191-36

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PLASTICS, SCIENTIFIC AND TECHNOLOGICAL (3rd edition), by H. R. Fleck, M.Sc., F.R.I.C. A completely revised edition of a recognised standard work on the chemistry and technology of plastics. " . . . should be in every technical library."—Times Review of Industry. Illustrated, 440 pages, 40s. net from booksellers, or 40s. 9d. by post from the publishers, Temple Press Ltd., Bowling Green Lane, London, E.C.1. zzz

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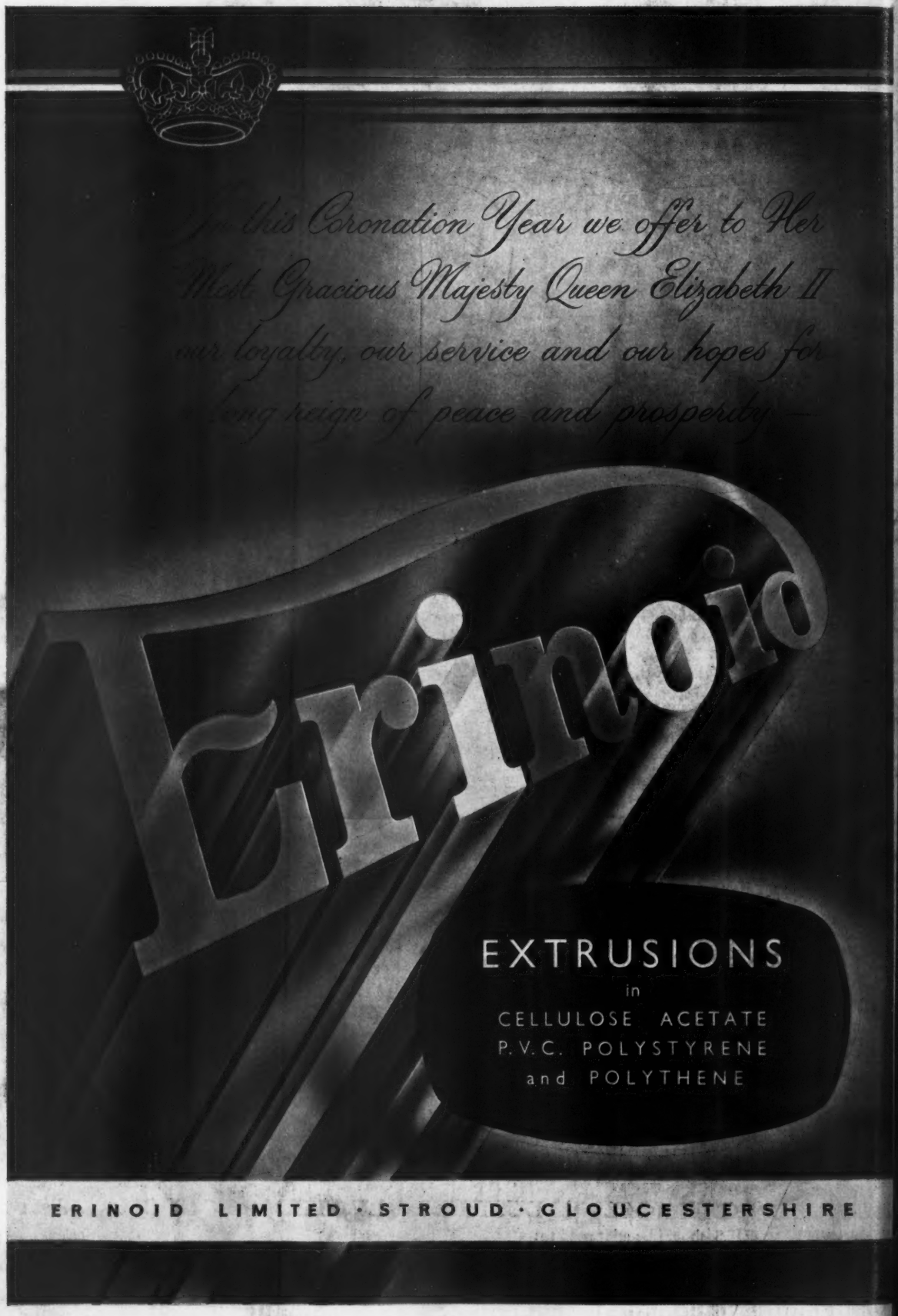
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